BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI

ORIGINAL APPLICATION NO. 74 of 2023 (SZ)

Padma Kumar, Kerala : Applicant

Vs.

The Chief Secretary to Government of Kerala,
Department of Environment, Thiruvananthapuram
and others : Respondents

REPORT FILED BY THE CHIEF ENVIRONMENTAL ENGINEER, KERALA STATE POLLUTION CONTROL BOARD, FOR AND ON BEHALF OF THE RESPONDENT

Adv. Rema Smrithi.V.K

ADDITIONAL STANDING COUNSEL FOR THE THIRD RESPONDENT

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI
IN

ORIGINAL APPLICATION NO. 74 of 2023 (SZ)

Padma Kumar, Kerala : Applicant

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Department of Environment, Thiruvananthapuram
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Dated this the 11th day of September 2023

Remasmrithi. V.K, Advocate

ADDITIONAL STANDING COUNSEL FOR THE THIRD RESPONDENT:

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI
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VOLUME 2

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Dated this the 11th day of September 2023

Remasmrithi. V.K, Advocate

ADDITIONAL STANDING COUNSEL FOR THE THIRD RESPONDENT:

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI

ORIGINAL APPLICATION NO. 74 of 2023 (SZ)

Applicant	:	Padma Kumar, Kerala
Respondents	:	The Chief Secretary to Government of Kerala, Department of Environment, Thiruvananthapuram and others

REPORT FILED BY CHIEF ENVIRONMENTAL ENGINEER, REGIONAL OFFICE, THIRUVANANTHAPURAM FOR AND ON BEHALF OF THE KERALA STATE POLLUTION CONTROL BOARD

1. I, Sreekala S., Aged 52 years, W/o Sri. A. Viswambharan, now working as Chief Environmental Engineer, Kerala State Pollution Control Board, Regional Office, Thiruvananthapuram. I am authorized to represent the Board (3rd respondent) in the above O.A. Copy of the authorization is produced as **Annexure -I**. I know the facts and circumstances of the case. The factual submissions are true and correct to the best of my knowledge, information and belief.

2. This Report is filed on behalf of the Kerala State Pollution Control Board, as directed by this Hon'ble NGT in its Order dated 07/08/2023. The Hon'ble NGT Principal Bench, New Delhi vide order dated 31/05/2023 had transferred the O.A. No.502 of 2022 to Southern Bench and renumbered as O.A. No.74 of 2023.

Background and status of OA. 502 /2022 :-

3. The Hon'ble NGT Principal Bench, New Delhi had registered a Suo Motu case in O.A No. 502/2022 based on a letter petition received from Sri. Padmakumar regarding pollution caused by M/s. Kerala Minerals and Metals Limited (KMML), situated in Chavara in Kollam district. In the above O.A., the petitioner alleges that the KMML is polluting the land and water bodies for about 30 years by discharging acid water and the area surrounding the factory has become unfit for any purpose and the villagers were forced to close the drinking water wells which were filled with acid. The petitioner further alleges that the industry is pumping acid waste directly to sea and connected lake through canals and also the Vattakkayal

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM *

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Chief Environmental Engineer

in Porookkara is filled with the acid clay waste polluting the environment and endangering life of the villagers.

4. The Hon'ble NGT vide order dated 29/08/2022 had constituted a Joint Committee comprising of Principal Secretary (Industries & NORKA), Central Pollution Control Board, State Pollution Control Board, State Wetland Authority and District Collector, Kollam and directed the joint committee to file a report after verifying the factual position. The State Pollution Control Board is the nodal agency for co- ordination and compliance. The Chief Environmental Engineer, KSPCB, Regional Office, Thiruvananthapuram is nominated as the member of the State Pollution Control Board to the above Committee vide proceedings No. PCB/HO/SEE- 1/NGT/O.A.NO.502/2022 dated 15/09/2022.

5. In compliance with the Hon'ble NGT order dated 29/08/2022 passed in O.A. No. 502/2022, the joint committee conducted a preliminary meeting through video conference on 11/10/2022 in the chamber of Chief Environmental Engineer, Regional Office, Thiruvananthapuram. The Joint committee conducted a site visit on 17/10/2022 to M/s KMML and its premises and collected samples from the affected areas of Ponmana, Chittoor, near the storm water discharge point of M/s. KMML, nearby canal leading to Ashtamudi Estuary, Porookkara and the Vattakkayal. The stagnant water samples and well water samples from the nearby premises of the unit, were also collected during the visit. The committee also inspected the ETP and iron oxide sludge ponds of the unit and sample from the effluent discharge point of the unit to the sea and sludge samples and tube well water samples inside the industry were collected for further analysis.

6. In compliance to the order, the Joint committee had submitted an interim status report before Hon'ble NGT vide email dated 29/11/2022 seeking additional time for filing report of the Joint Committee. Copy of the interim status report is produced herewith as **Annexure -II.**

7. Kerala State Pollution Control Board organised meeting of the joint committee on 01/12/2022 to discuss the analysis results of the samples collected during the visit to affected areas on 17/10/2022. The analysis results of the samples reveal that stagnant water samples collected from the nearby area of the company show acidic pH and presence of heavy metals. It is understood that the nearby area is polluted and the well water is not fit for drinking purpose. The samples collected from the ETP pond (supernatant) and treated effluent discharge outlet point of M/s. KMML shows neutral pH whereas the parameters such as Total Suspended Solids, Total Chromium, Iron, Manganese, Vanadium, and Titanium were

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Chief Environmental Engineer

exceeding the limits prescribed under the Integrated Consent to Operate issued to M/s. KMML, which clearly indicates that the existing effluent treatment plant is not adequate to comply to effluent discharge norms. One of the well water sample shows an acidic pH of 3.1 and the parameters such as Iron and Manganese are exceeding the limits of BIS Drinking Water Specifications i.e., IS 10500:2012. The other two well water samples shows neutral pH and the value of Iron exceeds BIS Drinking Water Specification. The tube well water samples collected from M/s. KMML shows a neutral pH of nearly 7 and also shows iron content. The tube wells are considerably deep and could be the reason for neutral pH of the water. The parameters such as Iron, Manganese, and Vanadium were present in the iron oxide sludge sample. All these parameters were exceeding the limits (as per MoEF guidelines) in the stagnant samples collected from the nearby premises. It may be inferred that there is every possibility of leakage or runoff from iron oxide sludge from the company to the nearby premises. The basic findings of the committee regarding the matter were shared with the company authorities, in compliance to the Hon'ble NGT order dated 29/08/2022.

8. The Joint Committee meeting was also convened on 09/12/2022 at M/s KMML and the Joint Committee held discussions with the officials of M/s. KMML on the status of remedial measures (both short term and long term measures) to curtail the pollution. The company authorities informed that their internal R & D team has developed a new technology of converting acidic iron oxide sludge into neutral metallic iron and the samples are sent to some steel industries and waiting for their response for utilizing as raw material. The R & D wing of M/s. KMML also came up with additional techniques which are under trial run. As a short term measure, trial for remediation of affected land is under progress and the same will be implemented to remediate the land outside outside the company premises, upon successful results. However, the permanent solution for this issue is acquisition of 76 acres of affected land around the company. Earlier 183 acres were identified and out of that 76 acres were the most affected area and the company have active plan to take up that land. The capping of the existing ponds can also be done to avoid contaminated runoff.

9. Subsequent to the Joint Committee meeting on 9/12/2022, Kerala State Pollution Control Board also collected samples from 14 tube wells, sludge samples from the old iron oxide pond, new iron oxide pond, ETP Pond area located within M/s. KMML. The analysis results of the 14 tube well samples reveal that the pH of the tube well water samples were within a range of 5.7-7.6 and iron content is present in all the samples in the ranges of 0.1 mg/L to 5.5 mg/L and exceeding the prescribed limits of BIS Drinking Water Specification (IS 10500:2012) except at two locations (i.e.,

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Chief Environmental Engineer

KLMKW 13 & KLMKW 14). Manganese is present in two tube well water samples (i.e., KLMKW4 & KLMKW 13) whereas Lead (0.27 mg/L) is present in one of the sample of ground water (ie., KLMKW 11) and exceeding the prescribed limit of BIS Drinking Water Specification (IS 10500:2012). As per M/s. KMML, the depth of ground water in the tube well located within industry premises is around 250- 300 feet below ground level and probably this could be the reason, all the tube well water do not show much contamination.

10. The analysis results of the sludge samples of old iron oxide pond, new iron oxide pond and ETP pond reveal that pH value of sludge from new iron Oxide pond observed as 1 which is highly acidic and falls under the hazardous waste category and requires pre-treatment for disposal into secured landfill in accordance with the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016 as amended, whereas the pH value of ETP sludge and sludge from old iron oxide pond observed as 6 and 10 respectively.

11. Subsequently, the Hon'ble NGT vide order dated 13/12/2022 in the above O.A., had directed the Joint committee to submit a final report by 31/01/2023 and directed all the respondents to file a report within two months by email. As per the direction from the Hon'ble NGT vide order dated 13/12/2022 in the above O.A., the Joint committee had submitted its final report before Hon'ble NGT vide email dated 31/01/2023. Copy of the final report is produced herewith as **Annexure -III**.

12. Based on the inspections held on 17/10/2022 and 9/12/2022, the Board had noticed that the unit is not complying with some of its consent conditions. Hence the Board had issued directions to the unit vide letter No.PCB/RO/KMML/NGT-O.A. No. 502/2022 dated 04/02/2023 to comply with conditions such as to keep the quality of treated effluent with the consent norms, to provide pH measurement facility at the outlet and maintain the records, to install the water meter to record the consumption of water, to install and maintain CAAQMS and OCEEMS and to furnish action taken report in this regard.

13. In concurrence to the Order dated 13/12/2022, State Pollution Control Board had submitted a report before Hon'ble NGT dated 07/02/2023. Copy of the report is produced herewith as **Annexure -IV**.

14. Meanwhile, the Hon'ble NGT , Principal Bench, New Delhi vide order dated 31/05/2023 had renumbered and transferred the above O.A. No.502 of 2022 to Southern Bench as O.A. No.74 of 2023. Copy of the Hon'ble NGT order is produced herewith as **Annexure -V.** The company vide letter

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM *

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Chief Environmental Engineer

dated 24/08/2023 has now submitted a compliance report. Copy of the compliance report of the industry is produced herewith as **Annexure -VI.**

15. A preliminary inspection was conducted from District Office of the Board on 23/08/2023 to verify the status of short term and long term measures proposed by the industry. The details are as follows:
    1) Garland drain was not completed around the old iron oxide pond and ETP Pond and was seen in progress. Garland drain works were not started around existing iron oxide pond.
    2) The company Officials reported that patch works/land remediation studies is in progress and land remediation sample test patch area development activities started on a trial basis.
    3) The company Officials informed that geotubes method has not received any approval from Government and that process modification of Acid Recovery Plant (ARP) tender approval is in progress and are currently waiting for Government sanction.

A detailed inspection on the compliance report of the industry will be conducted by the Board at the earliest.

All that is stated above are true to the best of my knowledge, information and belief.

Dated this the 11th day of September 2023

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM

CHIEF ENVIRONMENTAL ENGINEER

SREEKALA S.
Chief Environmental Engineer

ANNEXURE - I

☎: General: 0471- 2312910, 2318153, 2318154, 2318155 Chairman: 2318150 Member Secretary: 2318151
e-mail: chn.kspcb@gov.in; ms.kspcb@gov.in FAX: 2318152 web: kspcb.kerala.gov.in
KERALA STATE POLLUTION CONTROL BOARD
കേരള സംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്
Pattom P.O., Thiruvananthapuram – 695 004
പട്ടം പി.ഒ., തിരുവനന്തപുരം – 695 004

KSPCB/691/2022-SEE-1 Date: 19/07/2023

AUTHORISATION

Sub: OA. No.74/2023 (Earlier O.A.No. 502/2022 (PB)) before the Hon'ble NGT (SZ)

Ref: This office letter No. PCB/HO/SEE-1/NGT/O.A.NO.502/2022 dated 15/09/2022

In variation of the authorization issued vide reference, the Chief Environmental Engineer, Regional Office, Thiruvananthapuram is hereby authorized to represent the Board in the above O.A.

For and on behalf of the
KERALA STATE POLLUTION CONTROL BOARD

Sheeba AJ

MEMBER SECRETARY

To

The Chief Environmental Engineer
Regional Office
Thiruvananthapuram

Copy to:

1. Adv. Rema Smrithi V.K.
   No.2, Temple Glade Apartments
   Kalakshetra Colony
   Beach Road
   Besant Nagar
   Chennai – 600090
2. The Senior Environmental Engineer
   Legal Cell, Regional Office
   Ernakulam

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEWDELHI

IN

ORIGINAL APPLICATION NO. 502 of 2022

Petitioner : Padmakumar

Versus

Respondent(s) : The State of Kerala

INTERIM REPORT FILED BY THE JOINT COMMITTEE BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEWDELHI IN THE MATTER OF O.A. NO. 502/2022.

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEWDELHI

IN

ORIGINAL APPLICATION NO. 502 of 2022

Petitioner : Padmakumar

Versus

Respondent(s) : The State of Kerala

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Dated this the 28th day of November 2022

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEWDELHI

IN

ORIGINAL APPLICATION NO. 502 of 2022

Petitioner : Padmakumar

Versus

Respondent(s) : The State of Kerala

INTERIM REPORT FILED BY THE JOINT COMMITTEE BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEWDELHI IN THE MATTER OF O.A. NO. 502/2022.

1.0 Background

The Hon'ble National Green Tribunal (NGT) Principal Bench, New Delhi has registered O.A No. 502 of 2022 based on a letter petition received from Sri. Padmakumar regarding pollution caused by M/s. Kerala Minerals and Metals Limited (KMML), situated in Chavara, Kollam District, Kerala. The Hon'ble NGT vide order in O.A. 502/2022 dated 29/08/2022 had constituted Joint Committee comprising of;

1. Principal Secretary, Industries & NORKA
2. Central Pollution Control Board
3. State Pollution Control Board

4. State Wetland Authority

5. District Collector, Kollam

The State Pollution Control Board is specified as the nodal agency for co-ordination and compliance. The Chief Environmental Engineer, KSPCB, Regional Office, Thiruvananthapuram is nominated as the member of the State Pollution Control Board to above Committee vide proceedings No. PCB/HO/SEE-1/NGT/O.A.NO.502/2022 dated 15/09/2022.

The Hon'ble NGT has directed the committee to meet within two weeks, undertake visits to the site, look into the grievances of the applicant, associate the applicant and representative of the concerned project proponent, verify the factual position and submit its report within one month.

2.0 Joint committee meeting, visit to the site and report

In compliance with the Hon'ble NGT order dated 29.08.2022 passed in O.A. No. 502/2022, the joint committee convened a meeting through video conference on 11/10/2022 in the chamber of Chief Environmental Engineer, KSPCB, Regional Office, Thiruvananthapuram. Sri. J. Chandra Babu, Regional Director, CPCB, Smt. M. A. Rajeena Beegum, Additional Secretary, Industries Department and Sri. K. Sudhir, Additional Director, Directorate of Industries & Commerce (on behalf of Principal Secretary, Industries and NORKA Department), Sri. Roy Kumar F., Deputy Collector LA, Kollam and Sri. Chetan Kumar Meena, Sub Collector, Kollam (On behalf of District Collector, Kollam), Dr. Deepesh V., Scientist C, CPCB; Dr. John C. Mathew, Environment Programme Manager, Directorate of Environment and Climate Change (DoECC) representing State Wetland Authority Kerala; Sri. Chandra Bose, Managing Director, KMML and

Environmental Engineer, District Office, Kerala State Pollution Control Board, Kollam attended the meeting. The committee members expressed their views on the matter in the above case. The company representative gave a brief description about the company processes, ETP operations and disposal methods adopted for ETP sludge and iron oxide sludge. Environmental Engineer, District Office, Kollam presented the present status of operation of the industry and pollution issues. It was decided to conduct a joint committee visit to the M/s KMML industry and its premises at the earliest. It was also decided to hear the applicant and project proponent on the same day of visit. The minutes of the joint committee meeting held on 11/10/2022 is submitted herewith as **Annexure 1**.

As decided by the Joint Committee, visit to M/s. Kerala Metals & Minerals Ltd. and its premises was made on 17/10/2022 by the Joint Committee.

The committee met Sri. Padmakumar, the applicant in O.A. No. 502/2022 and heard the grievances of the applicant and the nearby residents. The joint committee members comprising Principal Secretary, Industries and NORKA Department; Regional Director, CPCB, Bengaluru; District Collector, Kollam; Chief Environmental Engineer, KSPCB and Wetland Specialist, State Wetland Authority Kerala (on behalf of Environment Programme Manager, DoECC) visited the affected areas of Ponmana, Chittoor, near the storm water discharge point of M/s. KMML, nearby canal leading to Ashtamudi Estuary and Porookkara and the Vattakkayal in the presence of the applicant (Mr. Padmakumar) and nearby residents and samples from stagnant water near the factory premises as opined by the applicant, were also collected during the visit. The committee also inspected the ETP and iron oxide sludge ponds of the unit and the point of discharge of treated ETP effluent to sea and samples were also taken for further analysis to

verify compliance to the prescribed effluent discharge standards. The minutes of the joint committee visit and meeting is submitted as **Annexure 2.**

The water and sludge samples taken from the industrial unit and its premises were taken to Central Laboratory, KSPCB, Ernakulam for processing and thereafter digested samples (21 Nos) were sent to Regional Lab of Regional Directorate, CPCB, Bengaluru for further analysis. As per the decision of the Joint Committee the final report shall be prepared and submitted before Hon'ble NGT at the earliest after obtaining the analysis result of the samples, sludge samples and samples of stagnant water near the industry premises collected during the visit of Joint Committee on 17/10/2022.

Submitted for kind consideration of this Hon'ble Green Tribunal.

Sri. Suman Billa
Principal Secretary
Industries and NORKA Department

Sri. J.Chandra Babu
Regional Director
CPCB

Smt. Arsana Perween
District Collector
Kollam

Smt. Sreekala S.
Chief Environmental Engineer
KSPCB

Dr. John C. Mathew,
Environment Programme Manager,
Directorate of Environment and Climate Change
Representing State Wetland Authority Kerala

Minutes of the Joint committee meeting (V. C.) held on 11/10/22 in the chamber of Chief Environmental Engineer, Regional Office, Thiruvananthapuram

The Hon'ble NGT vide order in OA 502/2022 dated 29/08/2022 constituted a Joint Committee to verify the factual position with respect to Kerala Minerals and Metals Ltd., Chavara, Kollam. Accordingly, the joint committee meeting was convened on 11/10/2022 at 11.00 am via online. The Chief Environmental Engineer welcomed all the participants to the meeting. The list of participants is given below.

1. Sri. J. Chandra Babu
   The Director
   Regional Directorate
   Central Pollution Control Board
   Bengalur, Karnataka

2. Smt. M. A. Rajeena Beegum
   Additional Secretary
   Industries department
   Government Secretariat
   Thiruvananthapuram

3. Sri. K. Sudhir,
   Additional Director,
   Directorate of Industries Commerce
   Vikas bhavan, Thiruvananthapuram

4. Sri. Roy Kumar F.
   Deputy collector LA,
   Collectorate,
   Kollam.

5. Sri. Chetan Kumar Meena
   Sub Collector
   Revenue Divisional Office,
   District Collectorate
   Kollam

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer

6. Dr. Deepesh V.
   Scientist 'C'
   Central Pollution Control Board
   Regional Directorate (South), Bengaluru.

7. Dr. John C. Mathew
   Environment Programme Manager
   Directorate of Environment and Climate Change
   Thampanoor, Thiruvananthapuram

8. Sri. Chandra Bose
   Managing Director
   Kerala Minerals and Metals Limited
   Sankaramangalam, Chavara
   Kollam

9. Smt. Rachel Thomas
   Environmental Engineer,
   District Office, Kollam

10. Smt. Sreetha A. M.,
    Assistant Environmental Engineer,
    Regional Office, Thiruvananthapuram.

11. Smt. Asha J.S.,
    Assistant Engineer,
    Regional Office, Thiruvananthapuram.

Joint committee members introduced themselves. The Chief Environmental Engineer detailed about the purpose of the meeting. The Hon'ble NGT vide order dated 28/08/2022 has directed the committee to meet within two weeks, undertake visits to the site, look into the grievances of the applicant, associate the applicant and representative of the concerned project proponent, verify the factual position and submit its report within one month. The case is posted on 13.12.2022. CEE explained that the industry effluent is having a low P^H and some spillage had occurred near the industry premises long before and the water bodies and soil near the premises are

KERALA STATE P.C. BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer

acidic in nature. She added that Sri. Padmakumar, local resident is the applicant in this case.

EE, DO, Kollam gave a brief description about the company process, consent details, waste generation & storage, pollution issues and long term and short term remedial measures proposed by M/s KMML. Sri. J. Chandra Babu, Regional director, CPCB enquired about the long term and short term measures implemented by the unit. The Managing Director of the unit replied that NEERI has suggested certain long term and short term remedial measures and the short term measures are nearing completion and long term measures are undergoing. The MD of the unit made a presentation on the company processes and status of long term and short term measures. He pointed out that Iron oxide sludge generated is 75 Metric tons per day and ETP sludge is around 50 Metric tons per day. The garland drain construction is 75% completed around the new ETP and about 40% completed around old ETP. This will be completed by December 2022. Another short term measure proposed by the company is the remediation of affected land near company premises and is planning to complete it by February 2023. Dewatering and storage of iron oxide sludge using Geotubes is also proposed for which tendering procedure is completed, and this is expected to implement by July 2023. The Acid recovery plant modification is pending for final Government approval. ETP sludge is being sold to an approved agency M/s Miracle Sands & chemicals in Tamil Nadu. There is also a discussion for transferring the iron oxide sludge to KEIL. As a part of social responsibility, the company is supplying drinking water (7 to 8 lakhs litre per day) and conducting monthly medical camps to the nearby residents and about

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM *

SREEKALA S.
Chief Environmental Engineer

2-3 crores has been spent last year for the welfare activities.

CEE pointed out that iron oxide is a dry product from the acid recovery plant, but it is converted to slurry form by adding water for the storage purpose. And also they are transferring the iron oxide sludge from the new pond to the old ponds. Sri. Chandra Bose, MD of the unit mentioned that they are transferring the iron oxide sludge to old ponds after neutralization. Regional Director asked about the waste water generation, treatment and its disposal and also about the capacity of the ETP tank and effluent generation. MD replied that the iron oxide sludge generated from the acid recovery plant are stored in the iron oxide ponds having seven layer protection. The iron oxide sludge was transferred from the new pond to the old pond and now it is almost in filled up condition. They are also planning for selling it as raw material. MD added that ETP tank is about two lakh tones and effluent generation is about 50 metric tons per day. RD enquired about the water consumption and waste water generation in the unit. Representative of M/s KMML replied that overall water consumption is about 6000 m^3 and a maximum of 1200 m^3/day of supernatant is discharged into the sea from the ETP settling pond.

Then CEE enquired the opinion of district administration regarding the land acquisition. The Sub collector, Kollam replied that about 76 acres of land is highly affected and there was a proposal for acquiring the land and is delayed due to some land cost issue. CEE mentioned that the matter regarding the land acquisition shall be discussed in detail during the joint inspection. CEE also reminded that the discussion with the complainant may also be conducted on the inspection day with the approval of committee

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM

Chief Environmental Engineer

members. The Environment Programme manager, Dr. John C. Mathew, (representative of SWAK) pointed out that the Vembanad lake is also mentioned in the complaint and is far away from this area. So it is better to hear from the complainant on this matter. The Additional Secretary, Smt. Rajeena Beegum added that the Principal Secretary is in an official trip till 14th October and the date of inspection can be finalized only in consultation with Principal Secretary. RD suggested to fix a convenient date for the site visit in the next week itself.

The meeting came to an end at 12.00 pm.

CHIEF ENVIRONMENTAL ENGINEER

KERALA STATE POLLUTION CONTROL BOARD
REGIONAL OFFICE
THIRUVANANTHAPURAM

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SREEKALA S.
Chief Environmental Engineer

Minutes of Joint Committee meeting, Site inspection and hearing of the complainant and the KMML held on 17/10/2022

As decided by the Joint Committee, a joint inspection of the committee members was conducted on 17/10/2022 to M/s. Kerala Metals & Minerals Ltd. and its premises. The following officials were present.

1. Sri. Suman Billa, Principal Secretary, Industries and NORKA Department-Member
2. Sri. J. Chandra Babu, Regional Director, Central Pollution Control Board, Bengaluru.-Member
3. Smt. Afsana Perween, District Collector, Kollam -Member
4. Smt. Sreekala S., Chief Environmental Engineer, Kerala State Pollution Control Board, Regional Office, Thiruvananthapuram. Member
5. Dr. Junaid Hassan S., Wetland Specialist, State Wetland Authority Kerala (On behalf of Dr John C. Mathew, Environment Program Manager, DoECC. - Member)
6. Sri. Roy Kumar F, Deputy Collector LA, Kollam.
7. Smt. Beena Rani R, Additional District Magistrate, Kollam.
8. Sri. Shibu P, Tahsildar, Karunagappally, Kollam.
9. Sri. Renjith V. G, Junior Resource person, DDC, Kollam.
10. Smt. Rachel Thomas, Environmental Engineer, District Office, Kollam

The committee first met Sri. Padmakumar, the applicant in O.A. No. 502/2022 and enquired about the complaint matter. He complained that M/s KMML company is polluting the nearby land and water bodies for approximately 30 years. Ponmana, Chittoor and Porookkara are the nearby areas affected by the working of the company. Majority of the people in these areas are suffering from skin diseases, respiratory ailments, eye irritation, asthma, allergy and the number of cancer patients are also increasing day by day. The local residents gathered at the inspection venue and they expressed their grievance before the committee. Sri. Padmakumar pointed out that the company is discharging its effluent as well as iron oxide mixed slurry to the nearby area

REGIONAL OFFICE

SREEKALA S.
Chief Environmental Engineer

during night time. Even after giving repeated complaints the company is continuing the same. All the wells in the nearby local bodies viz Ponmana, Chittoor, Kalari, Porookkara are polluted and unfit for drinking purpose. The company is supplying drinking water to these areas twice a day for about 2 hours in the morning and evening. The residents even complained about the quality of the water being supplied and also regarding the inadequate and intermittent supply.

There after, the joint committee visited the areas of Ponmana (North East of the company), Chittoor near Karungayil Sri. Arumukha Subramanya Temple, Chittoor (West of the company) and near Vattakkayal Lake shown by Sri. Padmakumar and the local people. Darkish Orange coloured stagnant water was seen in Chittoor, Ponmana regions from where samples are collected for analysis. The onsite checking of pH of the stagnant water (using litmus paper) showed pH in the range of 1-3. The residents complained that this contaminated water enters their compound even during slight rainfall and they are diagnosed with various skin diseases and other ailments. The wells in these areas are abandoned as the water is contaminated and unfit for drinking purpose. They also mentioned that land acquisition by the company should be done immediately. The committee after hearing the complainant and visiting the premises met for a joint meeting.

The case details were discussed in the meeting chaired by Sri. Suman Billa, the Principal Secretary who pointed out that committee has to comply with the Hon'ble National Green Tribunal order including preliminary meeting, site inspection, hearing the complainant and project proponent. Principal Secretary further suggested to verify the compliance of consent condition, water quality analysis of ground water as well as treated effluent being discharged by the KMML also and to verify the reason for low pH of the surrounding water and if there is any contribution from the company's part. Principal Secretary also added that the committee report should mention Principal Secretary is the Chairman of M/s. Kerala Metals & Minerals Ltd.

Sri. J Chandra Babu, Regional Director, Central Pollution Control Board explained that the committee shall file a report detailing the factual scenario in compliance to Hon'ble National Green Tribunal order dated 29/08/2022 prior to next date of hearing. The Regional Director (RD) added that the company shall submit the water consumption details, water balance chart, ETP details and sludge disposal and latest analysis report of treated effluent as well as ground water. The company shall also submit an action- wise timeline for completion of

SREEKALA S.
Chief Environmental Engineer

short term and long measures proposed and shall submit their report to the Board periodically. RD also added that the pH verification of the stagnant water samples showed pH around 1-3 which is highly acidic and cause health impacts to the animals too, if consumed. Danger sign boards shall be placed where ever required to avoid entry into such water body by the general public.

To the queries of Joint Committee regarding initiatives taken by KMML, Sri. Chandra Bose, Managing Director of KMML informed Joint Committee that sufficient quantity of lime is added for pH correction to treat the effluent before disposal and action plans are being implemented as per NEERI recommendations.

Smt. Afsana Perween, District Collector, Kollam added that matter regarding land acquisition was included in the previous minutes but the OA doesn't mention anything about this. District Collector also stated that the Kerala State Pollution Control Board shall conduct regular monitoring and verify whether they are conducting adequate treatment and also whether the mitigation measures proposed are adequate.

Sri. Junaid Hassan S., Wetland Specialist, State Wetland Authority Kerala pointed out that the Vattakkayal located near the concerned area is connected to Ashtamudi Ramsar Wetland through the TS canal; so samples may be taken if required from Vattakkayal. The location is far away from Vembanad Kol Ramsar Wetland.

Thereafter, the committee concluded its meeting with the following decisions.

1. To get the analysis of the collected samples at the earliest to include in the report.
2. To monitor the discharge of the company for a period of time.
3. To file a preliminary report before Hon'ble NGT within a month detailing the action taken so far in consultation with the standing counsel.
4. The committee shall meet on receipt of Analysis report to discuss and finalise the final report to be filed before Hon'ble NGT prior to the next date of hearing.

In the afternoon, site visit was done near the storm water discharge point of

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM

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the company, nearby canal leading to Ashtamudi Estuary and Porookkara and the Vattakkayal in the presence of the applicant (Mr.Padma Kumar) and nearby residents and samples were taken for further analysis. The inspected area of Vattakayal is seen filled with dark brown coloured sediments, sand and mud. The nearby residents informed that the width of Porookkara reach of the lake has been reduced drastically during the past 10-15 years. The residents were also complaining about the residues coming through the canal joining Vattakkayal in Porookkara region. Then the committee visited the ETP, ETP sludge pond and iron oxide sludge ponds inside the company. The company representative informed that new iron oxide sludge pond is filled up and permission was requested to transfer the sludge to old iron oxide sludge pond. Iron oxide sludge sample was collected from sludge pond for analysis. The committee also inspected the point of discharge of treated ETP effluent to sea and samples taken for further analysis to verify compliance to the prescribed effluent discharge norms.

The visit ended at 6.00 pm.

Sl.No.	Name of the Officers	Signature
1	Sri. Suman Billa Principal Secretary Industries and NORKA department	B. Suman.
2	Sri. J. Chandra Babu Regional Director, CPCB	
3	Smt. Afsana Perween District Collector, Kollam	Signed by Afsana Perween I A S Date: 03-11-2022 12:08:42
4	Smt. Sreekala S. Chief Environmental	

KERALA STATE POLLUTION CONTROL BOARD
REGIONAL OFFICE
THIRUVANANTHAPURAM

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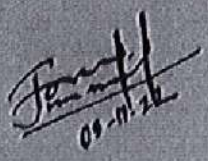
Chief Environmental Engineer

	Engineer KSPCB	
5	Dr. Junaid Hassan S. Wetland Specialist, SWAK. (On behalf of Dr. John C. Mathew, Environment Program Manager, DoECC)	

SREEKALA S.
Chief Environmental Engineer

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEWDELHI

IN

ORIGINAL APPLICATION NO. 502 of 2022

Petitioner : Padmakumar

Versus

Respondent(s) : The State of Kerala

REPORT OF THE JOINT COMMITTEE FILED BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEW DELHI IN THE MATTER OF O.A. NO. 502/2022.

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

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Dated this the 31st day of January 2023

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE

SREEKALA S.
Chief Environmental Engineer

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEWDELHI

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REPORT OF THE JOINT COMMITTEE FILED BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEW DELHI IN THE MATTER OF O.A. NO. 502/2022.

1. Background

The Hon'ble National Green Tribunal (NGT) Principal Bench, New Delhi has registered O.A No. 502 of 2022 based on a letter petition received from Sri. Padmakumar regarding pollution caused by M/s. Kerala Minerals and Metals Limited (hereafter referred as M/s. KMML) situated in Chavara, Kollam District, Kerala. The Hon'ble NGT vide order dated 29/08/2022 had constituted a Joint Committee comprising of;

1. Principal Secretary, Industries & NORKA
2. Central Pollution Control Board

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3. State Pollution Control Board

4. State Wetland Authority

5. District Collector, Kollam

The State Pollution Control Board is the nodal agency for co-ordination and compliance. Mrs. Sreekala S., The Chief Environmental Engineer, KSPCB, Regional Office, Thiruvananthapuram has been nominated as a member of the above Committee and to represent Kerala State Pollution Control Board vide proceedings No. PCB/HO/SEE-1/NGT/O.A.NO.502/2022 dated 15/09/2022.

The Hon'ble NGT has directed the committee to meet within two weeks, undertake visits to the site, look into the grievances of the applicant, associate the applicant and representative of the concerned project proponent, verify the factual position and submit its report within one month.

Kerala State Pollution Control Board being Nodal Agency for ensuring compliance to the Hon'ble NGT order dated 29.08.2022, filed an interim status report before Hon'ble NGT vide email dated 29.11.2022 seeking additional time for filing report of the Joint Committee. Hon'ble NGT further passed order on 13.12.2022 in the said matter and relevant portion of the Hon'ble NGT directions is reproduced below:-

5. *The Joint Committee is directed to submit its further report by 31.01.2023 by email at judicial-ngt@gov.in preferably in the form of searchable PDF/OCR Supported PDF and not in the form of Image PDF.*

11. *List for further consideration on 06.03.2023.*

Copies of the Hon'ble NGT orders dated 29.08.2022 and 13.12.2022 are enclosed as **Annexure-1 and Annexure - 2.**

2. About the M/s. KMML Industry, Process, Effluent Treatment and Waste Management - Overview

M/s. KMML is a fully integrated rutile grade titanium dioxide plant under Government of Kerala and its TiO_2 pigment unit was commissioned in 1984 at Sankaramangalam, Chavara, Kollam, Kerala with a titanium dioxide manufacturing capacity of 1459.125 TPA. Presently, the industry is involved in manufacture of titanium dioxide at 100 TPD (average). Satellite imagery of M/s KMML including the waste disposal area is depicted in **Figure.1** below.

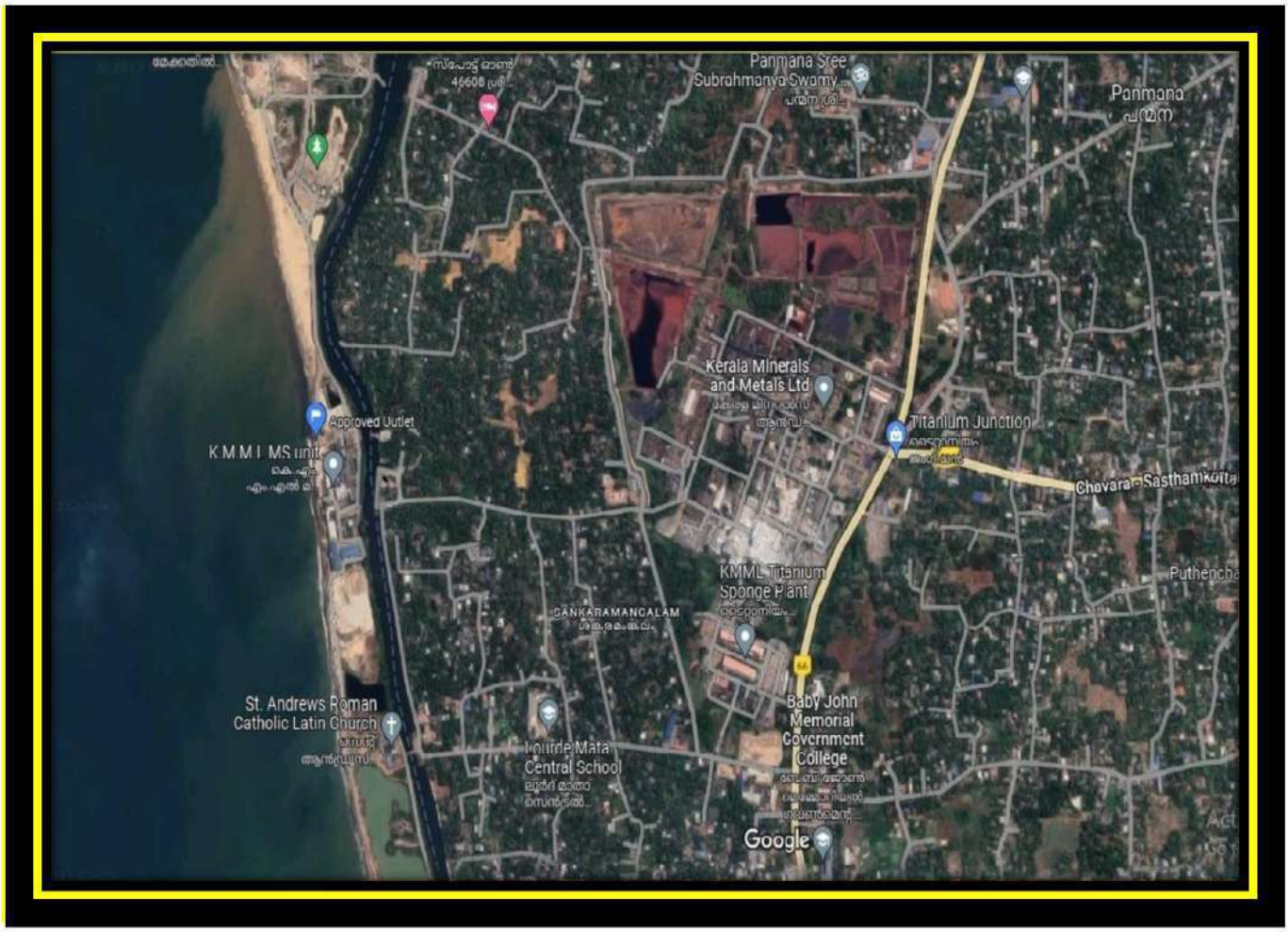


Figure 1. Satellite Imagery of M/s KMML including the Waste Disposal Area

2.1. Titanium Dioxide Manufacturing Process

M/s. KMML produces titanium dioxide from ilmenite mineral ore through the chloride process. The units in the titanium pigment factory include Ilmenite Beneficiation Plant, Chlorination Plant, Oxidation Plant and Pigment Finishing Unit. In the ilmenite beneficiation plant the raw Ilmenite containing 58 -60% of Titanium Dioxide is beneficiated to 90% Titanium Dioxide content. The major operations in Ilmenite Beneficiation Plant include Roasting/ Reduction, Digestion/ Leaching and Calcination. In the acid regeneration plant the spent leach liquor from digester is processed in a spray roster in which the liquid spray entering the furnace is atomized at high temperature (650 to 850^{O}C) in presence of air. The spent liquor then decomposes to solid metallic oxides and Hydrochloric Acid. The acid is absorbed in water and pumped back for digestion. The metallic oxides, mainly iron oxide, are slurried and stored in secured ponds. In the chlorination plant Beneficiated Ilmenite from Ilmenite Beneficiation Plant is chlorinated to produce Titanium Tetra Chloride. In the oxidation plant the Titanium Tetra Chloride is vaporized, preheated and oxidized with oxygen to produce raw Titanium Dioxide pigment at high temperature (1050^{O}C). The by-product chlorine is recycled to the chlorination plant. Raw titanium dioxide is slurried and pumped to the pigment finishing unit. In the pigment finishing unit the treated slurry is then washed and filtered. The filter cake is then subjected to drying to drive off the moisture followed by micronization. The micronized final pigment is then bagged using an automatic bagging machine. At present, for production of TiO_2 pigment, raw materials consumption i.e., ilmenite mineral ore (1.65 MT of raw ilmenite/ MT of Beneficiated Ilmenite (BI) -120 TPD of BI), Chlorine (0.115 MT of makeup chlorine/MT of $TiCl_4$ – 270 TPD of $TiCl_4$), Hydrochloric acid (0.85 MT of makeup acid/ MT of Beneficiated ilmenite- 120 TPD of BI). Water

consumption (6912 m^3/day). TiO_2 pigment Manufacturing process details is given in **Figure.2.**

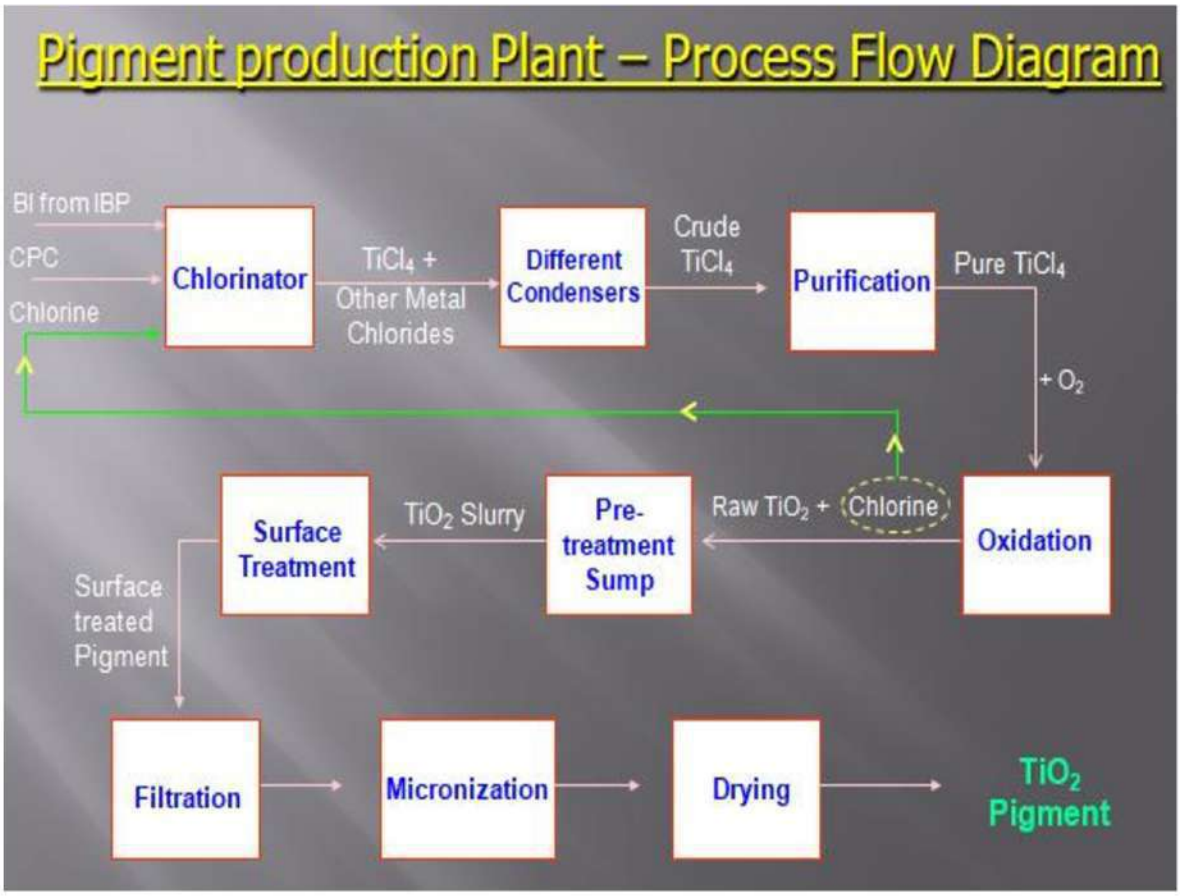


Figure.2. TiO_2 pigment Manufacturing Process

2.2. Status of Integrated Consent to Operate issued to M/s. KMML under The Environment (Protection) Act, 1986

The unit is having an integrated consent to operate including authorisation renewed on 13/09/2021 with validity up to 31/07/2025 for TiO_2 production of 120 tonnes/day (TPD). As per integrated Consent issued to M/s.KMML, the industrial unit is categorised as Red Category, total water consumption is 11,728 m^3/day from 14 tube wells located within the industry premises and the maximum quantity

of treated effluent discharged into the sea shall not exceed 4800m^3/day. Also, as per the consent condition, the unit shall install pH online measurement facility at the outlet, water meters shall be fixed to record consumption of water. Also, the process sludge i.e., iron oxide sludge (21.1 Category) quantity 50 TPD shall be stored in secured lined ponds and thereafter dewatered and disposed in Common Treatment Storage and Disposal Facility (CTSDF) at Kochi. CAAQMS (Continuous Ambient Air Quality Monitoring Station) and OCEEMS (Online Continuous Effluent and Emission Monitoring System) shall be installed and record maintained. The discharge norms of treated effluent prescribed under the Integrated Consent to Operate issued to M/s. KMML is given in the **Table 1** below.

Table 1. Tolerance Limit of Treated Effluent Prescribed to M/s.KMML

Sl. No.	Characteristics	Unit	Tolerance Limit
1	pH	mg/l (Max)	5.50 to 9.0
2	Suspended Solids	mg/l (Max)	100
3	Oil & Grease	mg/l (Max)	20
4	Total Residual Chlorine (as Cl)	mg/l (Max)	1.0
5	Total Chromium(as Cr)	mg/l (Max)	2.0
6	Zinc (as Zn)	mg/l (Max)	15.0
7	Titanium (as Ti)	mg/l (Max)	5.0
8	Lead (as Pb)	mg/l (Max)	2.0
9	Vanadium (as V)	mg/l (Max)	0.2
10	Manganese (as Mn)	mg/l (Max)	2.0
11	Iron (as Fe)	mg/l (Max)	3.0
12	Total Heavy Metals	mg/l (Max)	7.0

2.3. Water Consumption and Wastewater Effluent Treatment

As per the information provided by M/s KMML, there are 14 ground water tube wells within the industry premises of M/s. KMML. Presently, the water consumption is reported to be about 6912 m^3/day. Waste water generation is 3642 m^3/day (Maximum) and a maximum of 1200 m^3/day of treated effluent from the existing ETP is discharged through the approved outlet into the sea from the ETP settling pond. The details of water consumption and material balance are submitted as **Annexure 3 & Annexure 4** respectively. The flow diagram of ETP operated by M/s. KMML is shown in **Figure. 3**.

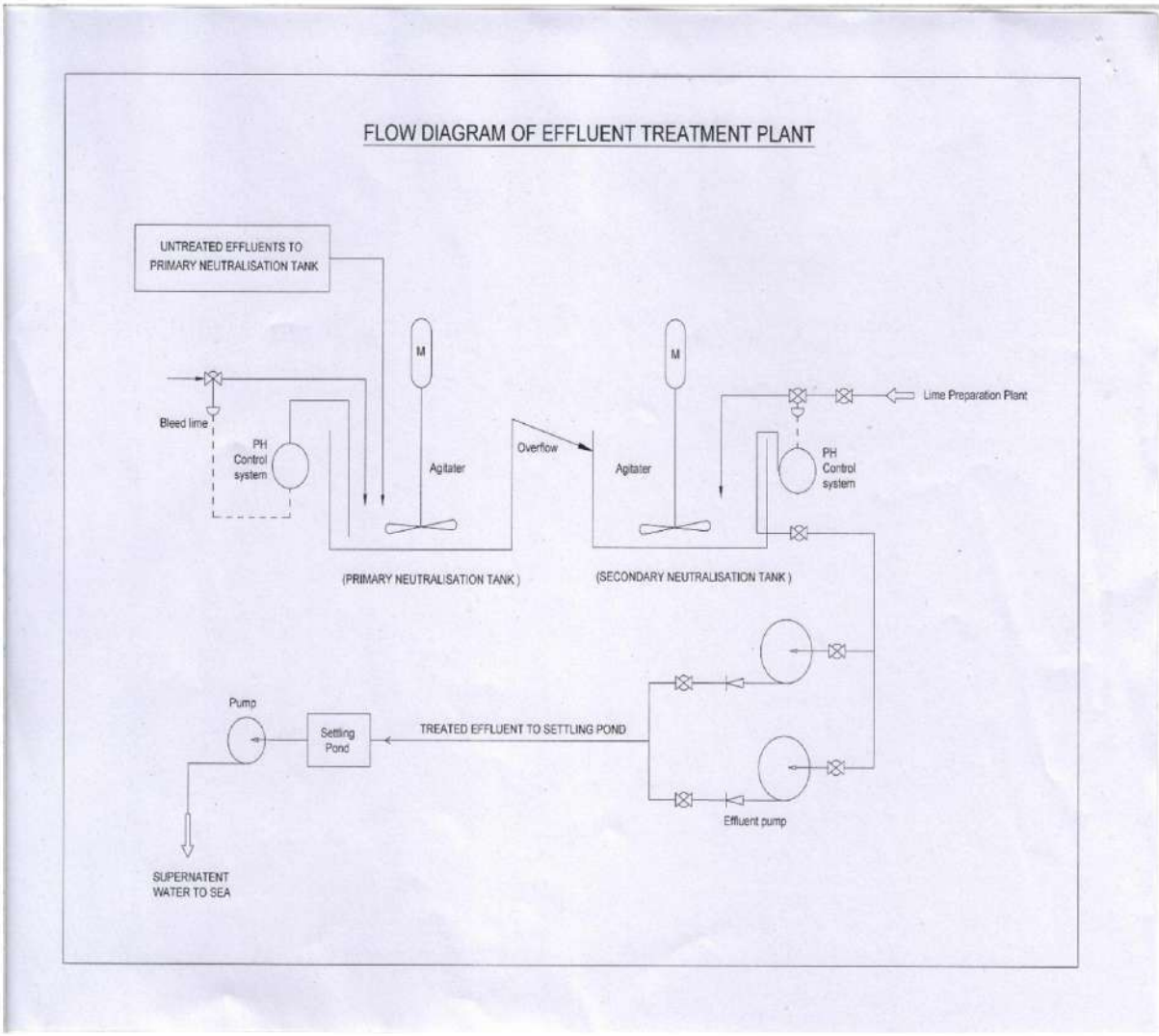


Figure 3. Flow Diagram of Effluent Treatment Plant operated by M/s.KMML

As per the information provided by M/s.KMML, at present the wastewater effluent is generated at about 3642 m^3/day, as a part of the TiO_2 manufacturing process. Effluent from all the process units (i.e., mainly ilmenite beneficiation plant, acid regeneration plant, and pigment production plant) are pumped to the primary neutralization tank (PNT) and neutralized with the lime scrubber provided. pH is monitored in the PNT and is maintained around 4-5 by the addition of lime solution and the retention time is about 60 minutes. The liquid in the primary

neutralization tank overflows into the secondary neutralization tank. In addition to the overflow from the primary neutralization tank, the effluents from various units of the pigment production plant (pH less than 4.5) are fed into the secondary neutralization tank. Overflow from primary neutralization tank, bleed lime from scrubber, effluent from area sump, effluent from solid waste tank and lime from lime preparation plant are the effluents neutralized in secondary neutralization tank. The retention time of the contents in the tank is around 25 minutes to 35 minutes and pH is maintained at 7-8. Neutralized Effluent is pumped to holding ponds. The treated effluent in the pond is periodically pumped to sea. It was reported by the industry that the quantity of lime added is about 40-50 MT/day. *However, pH meter and neither OCEEMS including flow meter not installed to the outlet before discharging of treated effluent in to the sea, for real time assessment of compliance to effluent discharge norms and total effluent discharged in to sea.*

2.4. ETP Waste and Iron Oxide Waste Management Scenario

M/s. KMML used to generate iron oxide sludge from acid regeneration plant at about 1451 TPA in the year 1985 and ETP sludge from the Effluent Treatment Plant, at around 729 TPA in the year 1984 and the generated wastes were stored within the industry premises in two number of old iron oxide ponds (claimed to have single LDPE liner with brick lining beneath) as well as two old ETP sludge ponds, which have already been filled and are not capped (as per CPCB guidelines issued in February 2001). As per M/s.KMML total quantum of iron oxide sludge stored in two old ponds was about 2,00,000 MT generated during the period 1985-2008 and ETP sludge from the Effluent Treatment Plant stored about 2,00,000 Metric Tonnes generated during the period 1984-2008, within the industry premises. As per information provided by M/s. KMML, the dimensions of the old ponds are given in the **Table 2** below

Table 2: Dimensions of Old Ponds within M/s. KMML Premises

Sl.No	Pond	Dimensions in metres	Area	Waste Stored Depth in metres
1	Iron oxide pond I	80x168	13440 sq.m.	4.5
2	Iron oxide pond II	71x174	12354 sq.m.	4.5
3	ETP settling pond I	69x267	18423 sq.m.	4.5
4	ETP settling pond II	77x246	18942 sq. m.	4.5

At present, as informed by M/s.KMML, TiO_2 pigment production is about 100 TPD and in the process, the iron oxide sludge from acid regeneration plant is generated (around 75 Tonnes per day (TPD) and ETP sludge from the Effluent Treatment Plant (around 50 TPD). Both iron oxide and ETP sludge are presently stored separately in two ponds constructed above the ground level with a liner system, in the year 2008. Capacity of the iron oxide pond constructed above the ground level is 1,35,200 m^3 and whereas the ETP pond capacity is 2,76,560 m^3 and at present, the capacity of the iron oxide and ETP sludge ponds are almost exhausted.

As per the records of District Office , Kollam, during the late 80's and early 90's due to failure of the liner of the iron oxide pond of the industry, acid from sludge pond had leaked into soil causing pollution of the soil and groundwater of the nearby area. Following this, a number of cases were filed against the industry before the Hon'ble Court of Kerala and the Hon'ble NGT. These underground ponds were abandoned in 2008 and a new pond (pond 3) was constructed. The details of the new ponds constructed in the year 2008 shown in **Table 3** below.

Table 3: Details of New Iron Oxide Sludge Pond and ETP Pond Constructed in the year 2008

Details	Iron Oxide Pond	ETP Pond
Area	33800 m^2	34570 m^2
Depth	4 m	8 m
Solid storage capacity	101400 m^3	241990 m^3
Total capacity of pond	135200 m^3	276560 m^3

M/s. KMML vide letter dated 08/01/2018 had requested Chairman, Kerala SPCB to temporarily transfer and store the iron oxide sludge from new pond (after neutralization maintaining a pH around 5) to the old ponds providing proper lining (with HDPE) and other precautionary measures and the Kerala SPCB had granted in principle clearance for the removal and transfer of iron oxide from pond no. 3 to pond no. 1 in strict compliance with directions issued in May 2018. Meanwhile, the company had obtained Integrated Consent to Establish (ICE) on 3/10/2018 for construction of a new iron oxide pond, but the work is not yet started. The company again requested for the temporary transfer of iron oxide from pond 3 to pond1 and pond 2. As per the meeting held on 06/11/2019, it was decided that the request cannot be permitted as pH of the slurry in the old pond was around 2 as per the report from Environmental Engineer, District Office, Kollam. During March 2020, the industry again requested to issue sanction for iron oxide sludge to M/s Miracle Sand and Chemicals, Tuticorin for processing the same in their facility at Tuticorin, Tamil Nadu. But the Board denied their request on 26/06/2020 as the

iron oxide sludge is not exempted from Hazardous waste category. Later as per the request from KMML, the Board had issued In- Principle Clearance vide letter dated 05/04/2021, for the removal and transfer of iron oxide from new pond to old pond, existing within the company premises, in strict compliance with the following directions.

1 The storage capacity and safety aspects of old pond shall be assessed and quantity beyond the capacity shall not be transferred.
2 The pH of transferring material from new pond shall be checked and neutralized at each time of transfer.
3 While transferring, the structural stability of the tanks shall not be affected.
4 The material shall be transported in leak proof vehicle and shall not spill over the plant premises.
5 The safety aspect shall be ensured at each stage by the Concerned Safety Department.

Since the third pond is reported to be almost completely filled and in the light of the upcoming monsoon season, the Board restricted the permission, for transfer of iron oxide sludge, to the monsoon season as per the decision in the meeting held on 16/05/2022. After receiving repeated complaints from nearby residence of Panmana, Chittoor and nearby areas of M/s. KMML, the Board had inspected the unit and not permitted the transfer of iron oxide sludge from new pond to old pond. It was reported by industry that 22500 MT of iron oxide is transferred from new pond to old ponds till now. The Board Vide letter dated 23/08/2022, issued directions to transfer the iron oxide slurry to M/s. Kerala Enviro Infrastructure Limited (M/s.KEIL) for scientific disposal in accordance with the Hazardous and Other Waste (Management & Transboundary Movement) Rules 2016 as well as

guidelines issued by CPCB. But the industry has reported that they have not initiated disposal of iron oxide to common TSDF as this activity was kept in abeyance from 08/08/2014 as directed by the Kerala State Government and presently awaiting reply from Principal Secretary regarding the review of transportation and disposal of iron oxide from M/s. KMML to Common Hazardous Waste Treatment and Disposal Facility (CHWTSDF) of M/s. KEIL located at Ambalamugal.

It was reported that about 1,70,454 MT of ETP sludge generated from April 2011 to March 2022. M/s. KMML had obtained permission from Kerala SPCB vide letter No. PCB/HO/KLM/ICO/08/08 dated 26/06/2020 for transfer 50,000 MT of ETP sludge to M/s. Miracle Sands & Chemicals, Tuticorin for processing and utilization. 10000 MT was already transferred during the month of June 2020, but they could not transfer the entire quantity due to Covid pandemic situation. Permission was granted by the Hon'ble Chairman vide letter No. PCB/HO/KLM/MIRACLE SANDS & CHEMICALS/2020 dated 22/08/2022 to M/s. Miracle Sands & Chemicals, Tuticorin for collection and transportation of the remaining 40000 MT of ETP sludge from M/s. KMML before 31/03/2023 without causing any environmental pollution and by taking necessary precautionary measures following the guidelines as applicable.

3. Initiatives of Kerala State Pollution Control Board including Joint Committee Meetings and the Field Visit

In compliance with the Hon'ble NGT order dated 29.08.2022 passed in O.A. No. 502/2022, Kerala State Pollution Control Board organised **first meeting** of the joint committee on **11/10/2022** through Video Conference in the chamber of Chief Environmental Engineer, KSPCB, Regional Office, Thiruvananthapuram.

As per the decisions taken in the first meeting, **joint committee visit to M/s KMML** industry and its premises was organised **on 17/10/2022** to hear the complainant and the industry representatives. *During the visit , the joint committee also gave an opportunity to Sri. Padmakumar, the applicant in O.A. No. 502/2022 and heard the grievances of the applicant and the nearby residents. The Joint Committee also visited the affected areas such as Panmana, Chittoor, near the storm water discharge point of M/s. KMML, a nearby canal leading to Ashtamudi Estuary and Porookkara and the Vattakkayal and nearby affected residential areas in the presence of the applicant (Sri. Padmakumar).* During the visit of Joint Committee to the surrounding affected residential areas, the officials of Kerala State Pollution Control Board also collected 18 number of water samples which include surface water/stagnant water/ground water and the sampling locations are shown in **Figure 4.**

Location details of the water samples collected during the visit of Joint Committee is given in the **Table 4** below.

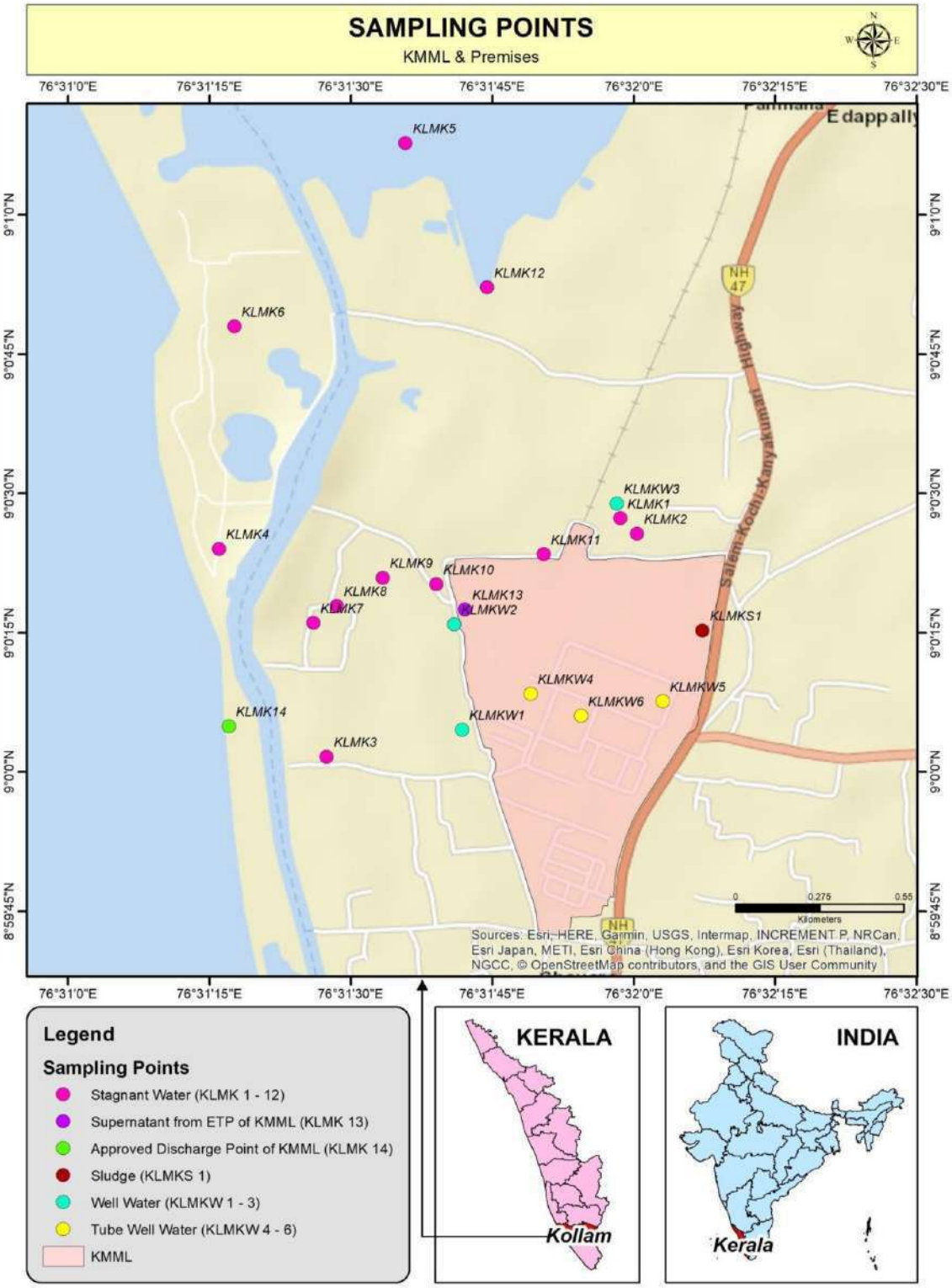


Figure 4. Water Sampling Locations dated 17.10.2022

Table 4. Location Details of the water samples collected during the visit of Joint Committee on 17/10/2022.

SAMPLE NUMBER	LOCATION POINT	LATITUDE	LONGITUDE
KLMK1	Stagnant water at north side of KMML ,backside of Hind Erectors Engineering Workshop(near home) in Panmana ward	9.007583	76.532935
KLMK2	Stagnant water at north side of KMML (backside Hind Erectors Engineering Workshop) in Panmana ward	9.007121	76.533434
KLMK3	Canal near MS Plant (drainage joining point) in Mekkad ward	9.000452	76.524285
KLMK4	T S Canal (while boating)	9.00666667	76.5211111
KLMK5	Stagnant water in Chittoor ward	9.018808333	76.5266111
KLMK6	Stagnant water near the house of Mr. Benedict,Mary Mandiram ,Chittoor,Panmana	9.013319	76.521565
KLMK7	Stagnant water near the house of Mr.Anandan,Vaishnokripa,Chittoor,Panmana	9.004451	76.5238962
KLMK8	Drainage water in frontof the house of Mr. Ajikumar,Aji Nivas,Chittoor,Panmana	9.004957	76.52458
KLMK9	Front side of Karungayil temple,Chittor,Panmana.	9.0058	76.525936
KLMK10	Right side of Gurumandiram, Chittoor, Panmana	9.005607	76.527518
KLMK11	North side outside KMML(storm water drain pipe from KMML compound	9.006509	76.530682
KLMK12	Point near Vattakayal	9.014487	76.52901
KLMK13	Supernatent from ETP of KMML	9.00485	76.52836
KLMK14	Approved discharge point of KMML (sea discharge)	9.001358	76.521407
KLMKS1	Sludge from KMML near ETP pond	9.004221	76.535363
KLMKW1	Well water from SasidharanPillai,Thengumpally, Chittoor,Chavara.	9.00125	76.52828

SAMPLE NUMBER	LOCATION POINT	LATITUDE	LONGITUDE
KLMKW2	Well water from Babu,BabuSadhanam,Chittoor ,Chavara	9.004408	76.528048
KLMKW3	Well water from Mohanan Pillai,Edapallil,Panmana,Chavara	9.008018	76.532833
KLMKW4	KMML Tube Well no-2	9.002332	76.530296
KLMKW5	KMML Tube Well no-4	9.002102	76.534188
KLMKW6	KMML Tube Well no-8	9.001671	76.531779

The stagnant water samples were collected from North side of M/s KMML in Panmana, Chitoor, near the house of Mr. Benedict and Mr. Anandan in Chitoor, front side of Karungayil temple and right side of Gurumandiram, Chittoor. The samples were collected from Canal near MS plant in Mekkad ward, T S canal (while boating), drainage in front of the house of Mr. Ajikumar, North side of M/s. KMML (storm water drain pipe from M/s.KMML compound), point near Vattakkayal. The committee also inspected the industrial unit and the samples from the ETP pond (supernatant), Iron Oxide Sludge pond and approved effluent discharge outlet point of M/s. KMML were also collected. Photographs taken during the site visit and sampling in the vicinity of human habitation around M/s. KMML on 17.10.2022 sit depicted in **Figure 5 to Figure 9** below.

Figure 5. Meeting with the Officials of M/s. KMML held on 17.10.2022

Figure 6. Interaction with local public on 17.10.2022 by the Joint Committee

Figure 7. Sampling of stagnant water and well water near M/s KMML on17.10.2022

Figure 8. Sampling Location near Vattakkayal

Figure 9. Sample collected at the effluent discharge outlet of M/s. KMML in to sea on 17.10.2022

The water and sludge samples collected were forwarded to Central Laboratory, KSPCB, Ernakulum and the digested samples were sent to Regional Lab of Regional Directorate, CPCB, Bengaluru for further analysis of general parameters

and heavy metals respectively. The analysis results of the samples collected during the Joint Committee visit on 17.10.2022 are given in **Table 5, 6, 7 &8** in subsequent paras.

Table 5. The Analysis Results of the stagnant water samples collected on 17/10/2022.

SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
1	KLMK 1	Stagnant water at north side of KMML ,backside of Hind Erectors Engineering Workshop (near home) in Panmana ward	pH	2.30	5.5 - 9.0
			Total Suspended solids	708.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	1424.00	3 mg/L
			Manganese	30.90	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	7.00	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.57	0.2 mg/L
			Titanium	BDL	Nil
2	KLMK 2	Stagnant water at north side of KMML (backside Hind Erectors Engineering Workshop) in Panmana ward	pH	2.10	5.5 - 9.0
			Total Suspended solids	520.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L

SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Iron	3528.00	3 mg/L
			Manganese	102.00	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.89	0.2 mg/L
			Titanium	BDL	Nil
3	KLMK 3	Canal near MS Plant (drainage joining point) in Mekkad ward	pH	2.40	5.5 - 9.0
			Total Suspended solids	187.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	294.00	3 mg/L
			Manganese	14.70	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.17	0.2 mg/L
			Titanium	BDL	Nil
4	KLMK 4	T S Canal (while boating)	pH	2.90	5.5 - 9.0
			Total Suspended solids	193.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L

SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Total Chromium	BDL	2 mg/L
			Iron	78.23	3 mg/L
			Manganese	3.02	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	0.34	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.41	0.2 mg/L
			Titanium	BDL	Nil
5	KLMK 5	Stagnant water in Chittor ward	pH	2.40	5.5 - 9.0
			Total Suspended Solids	174.00	Nil
			Oil &‘ Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	286.00	3 mg/L
			Manganese	14.60	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	1.19	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.17	0.2 mg/L
			Titanium	BDL	Nil
6	KLMK 6	Stagnant water near the house of Mr. Benedict,Mary Mandiram,Chittor,Panmana	pH	2.40	5.5 - 9.0
			Total Suspended Solids	351.00	Nil
			Oil &‘ Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L

SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	279.00	3 mg/L
			Manganese	12.50	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	2.59	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.14	0.2 mg/L
			Titanium	BDL	Nil
7	KLMK 7	Stagnant water near the house of Mr.Anandan, Vaishnokripa, Chittor,Panmana	pH	2.50	5.5 - 9.0
			Total Suspended Solids	310.00	Nil
			Oil &‘ Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	200.00	3 mg/L
			Manganese	9.70	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	1.39	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.17	0.2 mg/L
			Titanium	BDL	Nil
8	KLMK 8	Drainage water in front of the house of Mr. Ajikumar, Aji Nivas,Chittor, Panmana	pH	2.30	5.5 - 9.0
			Total Suspended Solids	2033.00	Nil
			Oil &‘ Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L

SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	416.00	3 mg/L
			Manganese	15.20	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.24	0.2 mg/L
			Titanium	BDL	Nil
9	KLMK 9	Stagnant water in front side of Karungayil temple,Chittoor, Panmana.	pH	2.50	5.5 - 9.0
			Total Suspended Solids	407.00	Nil
			Oil &‘ Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	182.00	3 mg/L
			Manganese	6.34	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	0.31	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.12	0.2 mg/L
			Titanium	BDL	Nil
10	KLMK 10	Stagnant water in right side of Gurumandiram, Chittoor, Panmana	pH	3.10	5.5 - 9.0
			Total Suspended Solids	316.00	Nil
			Oil &‘ Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil

SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	624.00	3 mg/L
			Manganese	19.20	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	2.60	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.56	0.2 mg/L
			Titanium	BDL	Nil
11	KLMK 11	North side outside KMML(storm water drain pipe from KMML compound	pH	2.50	5.5 - 9.0
			Total Suspended Solids	115.00	Nil
			Oil &‘ Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	378.00	3 mg/L
			Manganese	15.80	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	2.90	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.47	0.2 mg/L
			Titanium	BDL	Nil
12	KLMK 12	Point near Vattakayal	pH	3.00	5.5 - 9.0
			Total Suspended Solids	194.00	Nil
			Oil &‘ Grease	BDL	Nil
			Total Residual	BDL	Nil

SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Chlorine		
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	132.00	3 mg/L
			Manganese	5.00	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	120.00	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.19	0.2 mg/L
			Titanium	BDL	Nil

** *Guidance document for assessment and remediation of contaminated sites in India*

Table 6: Analysis results of Supernatant from ETP pond and at the effluent discharge outlet point of M/s. KMML into sea on 17/10/2022

SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per Consent issued to M/s KMML
1	KLMK 13	Supernatant from ETP settling pond	pH	7.40	5.5-9.0
			Total Suspended Solids	80273	100 mg/l
			Oil & Grease	BDL	20 mg/l
			Total Residual Chlorine	BDL	1 mg/l
			Copper	BDL	nil
			Cadmium	BDL	nil
			Total Chromium	22.40	2 mg/l
			Iron	1818	3 mg/l
			Manganese	20.90	2 mg/l

SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per Consent issued to M/s KMML
			Nickel	2.40	nil
			Lead	0.90	2
			Zinc	6.10	15
			Arsenic	BDL	nil
			Vanadium	3.12	0.2
			Titanium	268. 0	5
2	KLMK 14	Approved discharge point of KMML (sea discharge)	pH	7.00	5.5-9.0
			Total Suspended Solids	4515	100 mg/l
			Oil &' Grease	BDL	20 mg/l
			Total Residual Chlorine	BDL	1 mg/l
			Copper	BDL	nil
			Cadmium	BDL	nil
			Total Chromium	5.61	2 mg/l
			Iron	301	3 mg/l
			Manganese	4.20	2 mg/l
			Nickel	BDL	nil
			Lead	BDL	2
			Zinc	2.20	15
			Arsenic	BDL	nil
			Vanadium	5.87	0.2
			Titanium	41.60	5

Table 7: Analysis results of open well water collected near M/s KMML on 17.10.2022

SL No	Sample code	Sample Location	Parameters	Value	Acceptable Limit as per BIS Drinking Water Specification IS 10500-2012
1	KLMKW1	Well water from SasidharanPillai, Thengumpally,	pH	7.10	6.5-8.5
			Total Suspended Solids	26.00	Nil

SL No	Sample code	Sample Location	Parameters	Value	Acceptable Limit as per BIS Drinking Water Specification IS 10500-2012
		Chittoor,Chavara.	Oil &‘ Grease	BDL	Nil
			Total Residual Chlorine	BDL	0.2 mg/L
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	BDL	0.05 mg/L
			Iron	0.79	0.3 mg/L
			Manganese	BDL	0.1 mg/L
			Nickel	BDL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.01 mg/L
			Vanadium	BDL	Nil
			Titanium	BDL	Nil
2	KLMKW2	Well water from Babu, Babu Sadhanam, Chittoor, Chavara	pH	3.10	6.5-8.5
			Total Suspended Solids	BDL	Nil
			Oil &‘ Grease	BDL	Nil
			Total Residual Chlorine	BDL	0.2 mg/L
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	B DL	0.05 mg/L
			Iron	5.70	0.3 mg/L
			Manganese	2.43	0.1 mg/L
			Nickel	BDL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	0.11	5 mg/L
			Arsenic	BDL	0.01 mg/L
			Vanadium	0.10	Nil
			Titanium	BDL	Nil
3	KLMKW3	Well water from Mohanan Pillai, Edapallil, Panmana, Chavara	pH	7.10	6.5-8.5
			Total Suspended Solids	4191.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual	BDL	0.2 mg/L

SL No	Sample code	Sample Location	Parameters	Value	Acceptable Limit as per BIS Drinking Water Specification IS 10500-2012
			Chlorine		
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	BDL	0.05 mg/L
			Iron	225.00	0.3 mg/L
			Manganese	1.00	0.1 mg/L
			Nickel	BDL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.01 mg/L
			Vanadium	BDL	Nil
			Titanium	BDL	Nil

Table 8: Analysis results of tube well water collected inside M/s KMML

SL No	Sample code	Sample Location	Parameter	Value	Acceptable Limit as per BIS Drinking Water Specification IS 10500-2012
1	KLMKW4	KMML Tube Well no-2	pH	6.70	6.5-8.5
			Total Suspended Solids	BDL	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	0.2 mg/L
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	BDL	0.05 mg/L
			Iron	2.70	0.3 mg/L
			Manganese	BDL	0.1 mg/L
			Nickel	BDL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.01 mg/L

SL No	Sample code	Sample Location	Parameter	Value	Acceptable Limit as per BIS Drinking Water Specification IS 10500-2012
			Vanadium	BDL	Nil
			Titanium	BDL	Nil
3	KLMKW5	KMML Tube Well no-4	pH	6.70	6.5-8.5
			Total Suspended Solids	11.0	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	0.2 mg/L
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	BDL	0.05 mg/L
			Iron	1.20	0.3 mg/L
			Manganese	BDL	0.1 mg/L
			Nickel	B DL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.01 mg/L
			Vanadium	BDL	Nil
			Titanium	BDL	Nil
6	KLMKW6	KMML Tube Well no-8	pH	7.00	6.5-8.5
			Total Suspended Solids	BDL	Nil
			Oil &‘ Grease	BDL	Nil
			Total Residual Chlorine	BDL	0.2 mg/L
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	BDL	0.05 mg/L
			Iron	0.49	0.3 mg/L
			Manganese	BDL	0.1 mg/L
			Nickel	BDL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.01 mg/L
			Vanadium	BDL	Nil
			Titanium	BDL	Nil

Table 9: Analysis results of Iron Oxide Sludge sample collected on 17/10/2022

SL No	Sample code	Sample Location	Parameter	Observed Value (in mg/Kg except pH)
1	KLMKS1	Iron Oxide Sludge from KMML near ETP pond	pH	1.80
			Copper	BDL
			Cadmium	BDL
			Total Chromium	377.85
			Iron	173613.50
			Manganese	2306.89
			Nickel	BDL
			Lead	BDL
			Zinc	BDL
			Arsenic	BDL
			Vanadium	544.90
			Titanium	BDL

The analysis results of the samples collected during the visit of Joint Committee to the affected residential areas on 17/10/2022 reveal that all the stagnant water samples collected from the nearby premises of the industry, the canal near MS plant, TS canal and near Vattakkayal had acidic pH in the order of 2-3. The parameters such as Iron and Manganese were exceeding the limits in all these locations. Zinc exceeded in Northern side of M/s. KMML in Panmana and near Vattakkayal and Vanadium exceeded in some of the locations. The highest value of Iron is found as 3528 mg/l at North side of M/s.KMML in Panmana ward. The parameters such as Oil and grease, Total residual chlorine, Copper, Cadmium, Total chromium, Nickel, Lead, Arsenic and Titanium for all the samples collected outside the industry were Below Detectable Limit (BDL).

The samples collected from the ETP pond (supernatant) and treated effluent discharge outlet point of M/s. KMML shows neutral p^H whereas the parameters such as Total Suspended Solids, Total Chromium, Iron, Manganese, Vanadium, and Titanium were exceeding the limits prescribed under the Integrated Consent to Operate issued to M/s. KMML, which clearly indicates that the existing effluent treatment plant is not adequate to comply to effluent discharge norms.

One of the ***well water sample*** *(i.e., KLMKW2- Well water from Babu, Babu Sadhanam, Chittoor, Chavara) shows an acidic pH of 3.1 and the parameters such as Iron and Manganese are exceeding the limits of BIS Drinking Water Specifications i.e., IS 10500:2012.* The other two well water samples shows neutral pH and the value of Iron exceeds BIS Drinking Water Specification.

The tube well water samples collected from M/s. KMML shows a neutral pH of nearly 7 and also shows iron content. The tube wells are considerably deep and could be the reason for neutral pH of the water.

The parameters such as Iron, Manganese, and Vanadium were present in the iron oxide sludge sample. All these parameters were exceeding the limits (as per MoEF guidelines) in the stagnant samples collected from the nearby premises. It may be inferred that there is every possibility of leakage or runoff from iron oxide sludge from the company to the nearby premises.

Kerala State Pollution Control Board organised meeting of the joint committee on 01/12/2022 to discuss the analysis results of the samples collected during the visit to affected areas on 17.10.2022. Kerala State Pollution Control Board officials apprised the Joint Committee that

- The analysis results of stagnant water collected on 17/10/2022 is compared with MoEF&CC Guidance document for assessment and remediation of

contaminated sites in India, with respect to surface water and the parameters of well water is compared with the BIS Drinking Water Specifications (I.S. 10500:2012).

- The analysis of the stagnant water samples collected from the nearby area of the company show acidic pH and presence of heavy metals. All the three well water samples also show high concentration of iron and one sample shows acidic pH. It is understood that the nearby area is polluted and the well water are not fit for drinking purpose.
- The storm water sample (KLMK11) of the industry show acidic pH and presence of Iron, Manganese and Vanadium which implies that the land inside the industry is either polluted or there is a possibility of leakage / spillage of iron oxide sludge into nearby area including Vattakayal.
- The treated effluent sample from the industry shows total suspended solids and heavy metals above the limit specified which implies that the present treatment system is not adequate enough to comply with the effluent discharge standards and requires upgradation.
- The analysis of the stagnant water samples collected from the nearby area of the company show acidic pH and presence of heavy metals.
- All the three well water samples also show high concentration of iron and one sample shows acidic pH.
- It is understood that the nearby area are polluted and the wells are not fit for drinking purpose.
- The treated effluent sample from the industry shows total suspended solids and heavy metals above the limit specified which implies that the present treatment system is to be modified.
- The analysis results of the collected effluent discharge sample revealed that the parameters are exceeding the limits permissible under the consent norms,

and also existing effluent treatment system consisting of neutralization using lime followed by settling tank, which is not adequate for removal of heavy metals and also to comply with the effluent discharge norms. Therefore, the existing effluent treatment system should be upgraded to ensure compliance to the consent discharge norms.

- Based on the observations made during the visit that there is every chance of runoff from the existing iron oxide pond area especially during monsoon resulting pollution of nearby land. In order to avoid this, scientific approach should be followed in line with the guidelines issued by CPCB from time to time.
- KSPCB and the Members of the Joint Committee were of the view that proper sign boards should be placed at all the suitable places to avoid human/ animal contact with the polluted stagnant water bodies in the vicinity of the human habitation.

As a follow-up of the decision taken in the Joint Committee meeting held on 01/12/2022, the basic findings of the committee regarding the matter were shared with the company authorities, in compliance to the Hon'ble NGT order dated 29.08.2022. Joint Committee **meeting was also convened on 09/12/2022** at M/s KMML and the Joint Committee held discussions with the officials of M/s. KMML on the status of remedial measures (both short term and long term measures) to curtail the pollution. The representatives of M/s. KMML apprised Joint Committee in the meeting that

- A German company viz., M/s Tetrabic, approached to construct a plant inside the M/s.KMML for converting the ETP sludge and iron oxide sludge into usable products and this project is pending for State Government Approval. At present, the ETP sludge (about 50000 Tonnes) is being

transferred to M/s. Miracle Sands and Chemicals in Tamilnadu for processing and further utilization with the approval of the Kerala State Pollution Control Board (KSPCB). As on date, about 10000 Tonnes of ETP sludge already transferred to M/s. Miracle Sands and Chemicals in Tamilnadu.

- An internal R & D team of M/s. KMML has developed a new technology of converting acidic iron oxide sludge into neutral metallic iron and the samples are sent to some steel industries and waiting for their response for utilizing as raw material.

- The R & D wing of M/s. KMML also came up with additional techniques which are under trial run. One technique was tested within the company and found successful. About 2 to 3% of their profit is presently spent towards social commitment.

- Under the social responsible and commitment activities, which include welfare activities in 7 wards including the drinking water supply, sanitation and also conducting of regular medical camps etc.

- As a short term measure, trial for remediation of affected land is under progress and the same will be implemented to remediate the land outside the company premises, upon successful results. However, the permanent solution for this issue is acquisition of 76 acres of affected land around the company. Earlier 183 acres were identified and out of that 76 acres were the most affected area and the company have active plan to take up that land. The capping of the existing ponds can also be done to avoid contaminated runoff.

The minutes of the Joint Committee meetings held on 01/12/2022 and 09/12/2022 are annexed as **Annexure 5 & Annexure 6.**

Subsequent to the Joint Committee meeting on 9.12.2022, Kerala State Pollution Control Board also collected samples from 14 tube wells, waste samples from the old iron oxide pond, new iron oxide pond, ETP Pond area located within M/s. KMML. The locations detail of the tube well samples is given in **Table 10** and analysis results of the tube well samples collected on 9.12.2022 detailed in **Table 11.**

Table 10. Location details of the tube well samples inside M/s KMML collected on 9.12.2022

SL.NO.	SAMPLE ID	LOCATION	LATITUDE	LONGITUDE
1	KLM KW1	Near PSP Canteen	8.9958171	76.5311603
2	KLM KW2	Near Central store(right side)	9.0022353	76.5307499
3	KLM KW3	North side of KMML Employees co-operative society	9.002393	76.536141
4	KLM KW4	Near Civil Building	9.0020000	76.534424
5	KLM KW5	South side of LPG,near NH	8.9979492	76.5325786
6	KLM KW7	Right side of Water Treatment Plant	9.000892	76.531338
7	KLM KW8	Near boiler plant	9.001637	76.531758
8	KLM KW9	PPP area workshop(right side)	8.9991211	76.5310168
9	KLM KW11	Opposite to KMML parking area	9.000303	76.535438
10	KLM KW12	KMML guest house	8.996231	76.533472
11	KLM KW13	Ponnumvila Thahasildar office , Idappallikkotta	9.011124	76.532256
12	KLM KW14	Outside of KMML(near NH road working area)	9.009141	76.532201
13	KLM KW15	Near fire station	9.006237	76.537187
14	KLM KW16	South side of unit 400	8.9972399	76.5330382

Table 11. Analysis results of the tube well samples collected inside M/s KMML on 9.12.2022

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
1	KLMKW1	Near PSP Canteen	pH	-	6.40	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	BDL	1.0
			Conductivity	µS	153.00	Nil
			Alkalinity	mg/L	50.00	200
			Total Hardness as CaCO3	mg/L	29.00	200
			Calcium Hardness	mg/L	0.10	-
			Magnesium Hardness	mg/L	28.90	-
			Sulphate	mg/L	0.84	200
			Fluoride	mg/L	0.22	1
			Total Dissolved Solids	mg/L	96.00	500
			Nitrate	mg/L	4.98	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	11.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.77	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
2	KLMKW2	Near Central store(right side)	pH	-	5.70	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	0.20	1.0
			Conductivity	µS	122.00	Nil
			Alkalinity	mg/L	54.00	200
			Total Hardness as CaCO3	mg/L	32.00	200
			Calcium Hardness	mg/L	6.00	-
			Magnesium Hardness	mg/L	26.00	-
			Sulphate	mg/L	2.25	200
			Fluoride	mg/L	0.211	1
			Total Dissolved Solids	mg/L	93.00	500
			Nitrate	mg/L	2.51	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	10.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	B DL	0.05
			Iron	mg/L	0.81	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Titanium	mg/L	BDL	Nil
3	KLMKW3	North side of KMML Employees co-operative society	pH	-	6.60	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	2.50	1.0
			Conductivity	µS	168.00	Nil
			Alkalinity	mg/L	68.00	200
			Total Hardness as CaCO3	mg/L	51.00	200
			Calcium Hardness	mg/L	17.00	-
			Magnesium Hardness	mg/L	34.00	-
			Sulphate	mg/L	3.09	200
			Fluoride	mg/L	0.306	1
			Total Dissolved Solids	mg/L	106.00	500
			Nitrate	mg/L	3.07	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	10.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	1.50	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
4	KLMKW4	Near Civil	pH	-	7.00	6.5-8.5
			Colour	CU	20.00	5

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
		Building	Turbidity	NTU	16.50	1.0
			Conductivity	µS	244.00	Nil
			Alkalinity	mg/L	72.00	200
			Total Hardness as CaCO3	mg/L	100.00	200
			Calcium Hardness	mg/L	61.00	-
			Magnesium Hardness	mg/L	39.00	-
			Sulphate	mg/L	3.23	200
			Fluoride	mg/L	0.231	1
			Total Dissolved Solids	mg/L	163.00	500
			Nitrate	mg/L	3.30	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	12.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	5.50	0.3
			Manganese	mg/L	0.12	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
5	KLMKW5	South side of LPG,near NH	pH	-	7.60	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	BDL	1.0
			Conductivity	µS	447.00	Nil
			Alkalinity	mg/L	72.00	200

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Total Hardness as CaCO3	mg/L	152.00	200
			Calcium Hardness	mg/L	29.00	-
			Magnesium Hardness	mg/L	123.00	-
			Sulphate	mg/L	1.54	200
			Fluoride	mg/L	0.689	1
			Total Dissolved Solids	mg/L	370.00	500
			Nitrate	mg/L	62.50	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	13.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.93	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	B DL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
6	KLMKW7	Right side of Water treatment plant	pH	-	7.40	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	BDL	1.0
			Conductivity	µS	196.00	Nil
			Alkalinity	mg/L	62.00	200
			Total Hardness as CaCO3	mg/L	44.00	200
			Calcium Hardness	mg/L	16.00	-
			Magnesium	mg/L	28.00	-

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Hardness			
			Sulphate	mg/L	1.96	200
			Fluoride	mg/L	0.276	1
			Total Dissolved Solids	mg/L	133.00	500
			Nitrate	mg/L	0.51	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	12.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.82	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
7	KLMKW8	Near boiler plant	pH	-	6.20	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	1.00	1.0
			Conductivity	µS	134.00	Nil
			Alkalinity	mg/L	52.00	200
			Total Hardness as CaCO3	mg/L	43.00	200
			Calcium Hardness	mg/L	15.00	-
			Magnesium Hardness	mg/L	28.00	-
			Sulphate	mg/L	2.53	200
			Fluoride	mg/L	0.251	1
			Total Dissolved Solids	mg/L	97.00	500

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Nitrate	mg/L	5.43	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	15.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.95	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
8	KLMKW9	PPP area workshop (right side)	pH	-	7.50	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	2.00	1.0
			Conductivity	µS	730.00	Nil
			Alkalinity	mg/L	98.00	200
			Total Hardness as CaCO3	mg/L	278.00	200
			Calcium Hardness	mg/L	84.00	-
			Magnesium Hardness	mg/L	194.00	-
			Sulphate	mg/L	2.25	200
			Fluoride	mg/L	0.479	1
			Total Dissolved Solids	mg/L	487.00	500
			Nitrate	mg/L	18.63	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	13.90	250

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	1.10	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
9	KLMKW11	Opposite to KMML parking area	pH	-	6.10	6.5-8.5
			Colour	CU	5.00	5
			Turbidity	NTU	1.00	1.0
			Conductivity	µS	159.00	Nil
			Alkalinity	mg/L	44.00	200
			Total Hardness as CaCO3	mg/L	31.00	200
			Calcium Hardness	mg/L	23.00	-
			Magnesium Hardness	mg/L	8.00	-
			Sulphate	mg/L	1.83	200
			Fluoride	mg/L	0.196	1
			Total Dissolved Solids	mg/L	140.00	500
			Nitrate	mg/L	17.79	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	10.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.86	0.3

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	0.27	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
10	KLMKW12	KMML guest house	pH	-	6.60	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	BDL	1.0
			Conductivity	µS	258.00	Nil
			Alkalinity	mg/L	100.00	200
			Total Hardness as CaCO3	mg/L	85.00	200
			Calcium Hardness	mg/L	21.00	-
			Magnesium Hardness	mg/L	64.00	-
			Sulphate	mg/L	5.20	200
			Fluoride	mg/L	0.312	1
			Total Dissolved Solids	mg/L	161.00	500
			Nitrate	mg/L	7.71	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	7.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.43	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
11	KLMKW13	Ponnumvila Thahasildar office , Idappallikkotta	pH	-	7.20	6.5-8.5
			Colour	CU	20.00	5
			Turbidity	NTU	0.80	1.0
			Conductivity	µS	184.00	Nil
			Alkalinity	mg/L	42.00	200
			Total Hardness as CaCO3	mg/L	26.00	200
			Calcium Hardness	mg/L	19.00	-
			Magnesium Hardness	mg/L	7.00	-
			Sulphate	mg/L	7.20	200
			Fluoride	mg/L	0.27	1
			Total Dissolved Solids	mg/L	154.00	500
			Nitrate	mg/L	21.66	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	6.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.10	0.3
			Manganese	mg/L	0.22	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
12	KLMKW1	Outside	pH	-	7.00	6.5-8.5

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
	4	of KMML(near NH road working area)	Colour	CU	10.00	5
			Turbidity	NTU	0.70	1.0
			Conductivity	µS	146.00	Nil
			Alkalinity	mg/L	20.00	200
			Total Hardness as CaCO3	mg/L	39.00	200
			Calcium Hardness	mg/L	18.00	-
			Magnesium Hardness	mg/L	21.00	-
			Sulphate	mg/L	5.30	200
			Fluoride	mg/L	0.234	1
			Total Dissolved Solids	mg/L	104.00	500
			Nitrate	mg/L	12.50	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	12.00	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.14	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
13	KLMKW15	Near fire station	pH	-	6.80	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	0.80	1.0
			Conductivity	µS	199.00	Nil
			Alkalinity	mg/L	80.00	200

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Total Hardness as CaCO3	mg/L	63.00	200
			Calcium Hardness	mg/L	41.00	-
			Magnesium Hardness	mg/L	22.00	-
			Sulphate	mg/L	5.62	200
			Fluoride	mg/L	0.326	1
			Total Dissolved Solids	mg/L	150.00	500
			Nitrate	mg/L	12.56	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	7.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.66	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
14	KLMKW16	South side of unit 400	pH	-	6.20	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	0.70	1.0
			Conductivity	µS	168.00	Nil
			Alkalinity	mg/L	52.00	200
			Total Hardness as CaCO3	mg/L	57.00	200
			Calcium Hardness	mg/L	35.00	-
			Magnesium	mg/L	22.00	-

Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Hardness			
			Sulphate	mg/L	4.40	200
			Fluoride	mg/L	0.249	1
			Total Dissolved Solids	mg/L	115.00	500
			Nitrate	mg/L	6.30	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	19.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	2.40	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil

The analysis results of the 14 tube well samples reveal that the pH of the tube well water samples were within a range of 5.7-7.6 and iron content is present in all the samples in the ranges of 0.1 mg/L to 5.5 mg/L and exceeding the prescribed limits of BIS Drinking Water Specification (IS 10500:2012) except at two locations (i.e., KLMKW 13 & KLMKW 14). Manganese is present in two tube well water samples (i.e., KLMKW4 & KLMKW 13) whereas Lead (0.27 mg/L) is present in one of the sample of ground water (i.e., KLMKW 11) and exceeding the prescribed limit of BIS Drinking Water Specification (IS 10500:2012).

As per M/s. KMML, the depth of ground water in the tube well located within industry premises is around 250- 300 feet below ground level and probably this could be the reason, all the tube well water do not show much contamination.

The analysis results of sludge samples from new and old iron oxide ponds as well as ETP sludge sample collected on 9.12.2022 is given in the **Table 12** below.

Table 12. The analysis results of sludge samples collected from new and old iron oxide ponds as well as ETP sludge collected on 9.12.2022

Sl. No	Sample code	Sample Location	Parameter	Observed Values (in mg/kg except pH)
1	KLMKE1	Old Iron Oxide Pond	pH	10.0
			Copper	BDL
			Cadmium	BDL
			Total Chromium	453.87
			Iron	123532.3
			Manganese	2289.09
			Nickel	BDL
			Lead	BDL
			Zinc	BDL
			Arsenic	BDL
			Titanium	670.94
			Vanadium	513.07
2	KLMKE2	ETP Pond	pH	6.0
			Copper	BDL
			Cadmium	BDL
			Total Chromium	399.31
			Iron	24757.4
			Manganese	379.34
			Nickel	BDL
			Lead	BDL

Sl. No	Sample code	Sample Location	Parameter	Observed Values (in mg/kg except pH)
			Zinc	BDL
			Arsenic	BDL
			Titanium	4312.58
			Vanadium	339.41
3	KLMKE3	New Iron Oxide Pond	pH	1.0
			Copper	BDL
			Cadmium	BDL
			Total Chromium	285.29
			Iron	134084.58
			Manganese	1658.22
			Nickel	BDL
			Lead	BDL
			Zinc	463.59
			Arsenic	BDL
			Titanium	909.35
			Vanadium	499.25

The analysis results of the sludge samples of old iron oxide pond, new iron oxide pond and ETP pond reveal that the parameters such as Copper, Cadmium, Nickel, Lead, Arsenic are observed as 'Below Detection Limit' and parameters such as Iron, Manganese, Total Chromium, Titanium and Vanadium are present in all three sludge samples collected on 9.12.2022. Zinc is also present in the sludge sample of new iron oxide pond.

The analysis results also reveal that pH value of sludge from new iron Oxide pond observed as 1 which is highly acidic and falls under the hazardous waste category and requires pre-treatment for disposal into secured landfill in accordance with the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016 as amended, whereas the pH value of ETP sludge and sludge from old iron oxide pond observed as 6 and 10 respectively.

4. Status on Implementation of Time Bound Acton Plans as submitted by M/s.KMML

A petition was filed by Sri. Joy Kaitharnath against M/s KMML regarding the pollution issues of the industry (O.A 142/2013, 290/2013 and 453/2013 in Hon'ble NGT southern zone). Hon'ble NGT vide order dated 31/08/2017 had directed M/s. Kerala Minerals and Metals Limited (KMML), to prepare short term and long term measures through competent and expert developers/contractors and such processes should be completed within the time frame. Hon'ble NGT vide order dated 31/08/2017 also directed the industry to prepare an appropriate scientific scheme through Expert/Contractor with specific timeframe for soil remediation and ground water remediation and also to supply adequate potable water to the people residing in and around its industrial premises.

Hon'ble Tribunal vide order dated 31/08/2017 had directed the industry "*to deposit a sum of Rs. 1,00,00,000/- (Rupees One Crore Only) under "Polluter Pays Principle" in favour of Chairman, Kerala State Pollution Control Board" who shall keep the said amount in separate account named as "Environmental Relief Fund for remediation of Chavara Region due to pollution caused by Kerala Minerals and Metals Limited (KMML). The said amount shall be managed by the Chief Secretary, Government of Kerala and Chairman, Kerala State Pollution Control Board jointly and shall be utilised for remediation and/or for distribution to the affected persons either as per the direction of this Tribunal or as per the decision of the State Government.*"

The Kerala State Pollution Control Board is also directed to monitor the implementation of the scheme and also directions issued by this Tribunal to be carried out by the unit and if there is any violation found, they are directed to take

appropriate action against the unit including imposition of environmental compensation for the damage caused to the environment, if any, due to further non-compliance of directions issued by the Tribunal. The status on time bound action plan submitted by M/s. KMML is detailed in subsequent paras.

4.1. Short Term Measures

Item	Work status	Target	Remarks	Remarks of the Joint Committee
Construction of Garland drain around the iron oxide (IOP)/ETP ponds	After open e-tendering work order for the Construction of Garland drain around new ETP/IOP and old ETP/IOP was issued to M/s Ravi Kumar & M/s Biohomes on 08/10/2019 and 08/04/2021 respectively. The period of contract was extended due to events viz. adverse climatic condition, restriction imposed as part of pandemic COVID19 lock down, local labour issues, ETP sludge shifting process etc. The works are now progressing at site.	Jan 2023 (NEW ETP) Mar 2023 (OLD ETP/IOP)	About 75% of garland drain Constructio n around New ETP and 40% around old ETP/IOP has been completed.	The runoff through proposed garland drain construction around the existing iron oxide pond need to be connected to the suitable treatment system to avoid acid bearing surface runoff into the nearby low lying areas or human habitation. The other option is that the entire existing iron oxide dump yard should be covered with suitable liner (s) temporarily till zero waste policy is adopted, to avoid contaminated run off. If no solution is found by the industry, entire iron oxide sludge dump yards to be capped permanently in line with the guidelines issued by CPCB or disposed off through a TSDF located in Kerala in accordance with the Hazardous and Other Waste (Management &

Item	Work status	Target	Remarks	Remarks of the Joint Committee
				Transboundary Movement) Rules, 2016 as amended
Remediation of affected land near KMML Premises	E-Tender was invited for the Test patch for remediation of contaminated area inside KMML Premises and its consultancy works on 09/07/2019. No parties quoted. Action for limited tender for consultancy work taken on 07/08/2019. Two parties quoted the tender. Work order was issued to M/s FEDO on 05/12/2019 for consultancy and supervision of the test patch area for contaminated land in KMML premises. M/s FEDO have submitted a detailed project report with schematic drawing and lay out of the contaminated land remediation work. Tendering for test patch done in three occasions ie, 25/02/2020 (only single offer received),	Time Frame set is one year for test patch (March 2023)	Land preparation for the test patch unit completed and tendering activities for the remediation of the test patch area is in progress.	The remediation of surrounding area is not an easy task and industry should come out with the alternate options for utilization of generated process sludge, in a time bound manner. Industry should assess the contaminated areas through an institute of repute and remedial measures to be taken in accordance with the Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 as amended

Item	Work status	Target	Remarks	Remarks of the Joint Committee
	24/06/2020 & 19/08/2020 (no party quoted). Due to non receipt of offers, action for doing the activity on trial basis has been initiated by inviting open e-tender. Accordingly land preparatory works for the test patch area completed and tendering activities for the remediation of the test patch area is in progress.			
Solid waste management in KMML (In situ/Ex-situ storage) - Geo tube as a trial implementation	Considering the constraint for shifting the entire quantity of sludge to newly proposed containment system and limitation of vacant land availability, another technological option was identified by KMML through US based Titanium technology consultant. The new technology involves dewatering	Time set is one year after getting approval from CPCB/KSPCB and subsequent ordering	Stage- 1 of this work can be completed in a period of 8-10 months, upon receipt of requisite approvals	Need approval from KSPCB and CPCB for adopting geotube technology. Hence, this method may be reviewed as the ultimate safe disposal of waste is required and the unit may explore to adopt alternate technology so as to convert iron oxide sludge into useful products.

Item	Work status	Target	Remarks	Remarks of the Joint Committee
	and storage of solid waste using GEOTUBES which was presented to KSPCB in the meeting held on 10/12/2018. In principle approval was received and directed to submit details of the proposal. Tendering action for the Geotube iron oxide containment from new elevated iron oxide pond was done, received two offers & the same got placed before Board of Directors meeting for approval. Subsequently, Geotube suppliers had intimated KMML to get environmental clearance to submit offer for the tender. KMML submitted a request letter to KSPCB on 23/02/2022 for Environmental clearance approval to go ahead with the collection and			

Item	Work status	Target	Remarks	Remarks of the Joint Committee
	containment of Iron oxide slurry in Geotube from the elevated new iron oxide pond as trial phase activity. Dewatered Iron oxide solids can safely be transferred to offsite after the containment. A presentation of solid waste management using Geotubes was conducted at the chamber of Chairman, KSPCB on 16/05/2022 and 14/10/2022. KMML officials visited CPCB, New Delhi on 28/11/2022 and handed over the request letter for obtaining authorization for conducting trial geotube filling and containment of iron oxide from new elevated iron oxide pond. Work can be started only with the technical concurrence of CPCB/KSPCB			

4.2. Long Term Measures

Item	Work status	Target	Remarks	Remarks of the Joint Committee
Acid Regeneration plant (ARP) technology modification to generate saleable iron oxide	Tender was invited and opened in September 2019 & only one party quoted. Tender was closed on December 2019 and after evaluation of the proposal, the file was put up to the Board for approval. 243rd Board meeting of the company held on 21/05/2020 had accorded approval for seeking final Government sanction. The file was put up to the Government on 01/06/2020, for getting final sanction. However as per the direction given by Government of Kerala, retendering done on June 2021. Global Tender was invited from technology providers for the process modification of existing Acid Regeneration plant on 10/06/2019. The offer submitted by M/s INDROX GLOBAL PVT. LTD. Is evaluated, approved in the 250th Board of meeting held on 15/01/2022 and submitted for Government approval. A meeting was convened under the chairmanship of	18 months from order	Awaiting Government approval	Technology modification shall be implemented soon to result in toxic constituent and acidic free iron oxide sludge generation and to facilitate converting to saleable products.

Item	Work status	Target	Remarks	Remarks of the Joint Committee
	Hon'ble Minister for Industries, Law & coir on 09/06/2022 and in the meeting, it was decided to work out the price reasonableness & submit report to Government of Kerala. Accordingly, FEDO had done the cost analysis study & the report got submitted to Government for approval to place order.			
Value addition of by products (Iron oxide/ETP sludge)	KMML identified M/s Renuka Equipments Pvt. LTD, Nagpur, with the help of M/s NEERI as the competent technology provider for the management of iron oxide stored in the old pond, by converting the same in to usable product. 234th Board meeting held on 04/04/2018 had given permission in principle for receiving a detailed techno-commercial offer for setting up a pilot plant from M/s REPL. We have received offer from M/s REPL and evaluated. It is noticed that the proposed technology is not field proven one and also involves investment around Rs.400 Crores on commercial scale set up. In order to select potential agencies to carry out value	18-24 months from the date of order/statutory clearance.	Board approval obtained, awaiting Govt, approval for final agreement.	Necessary approval from Kerala State Pollution Control Board and CPCB shall be obtained for trial run as per Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 as amended as well as adopting the technology and it is the most recommended method for disposing the existing iron oxide sludge.

Item	Work status	Target	Remarks	Remarks of the Joint Committee
	addition of iron oxide & ETP sludge on a total responsibility basis with suitable technology, we have published a global expression of Interest and the last date to offer was 15/03/2022. Offers are received from parties and CSIR-NIIST, TVM was appointed as consultant to carry the technical evaluation of the proposal and they have submitted their study report. Tender was invited, Board approval obtained for awarding order to the selected parties obtained, awaiting Govt approval for final agreement.			R&D team shall come up with more and more feasible technologies in this field.

4.3. Other Initiatives of M/s. KMML

Item	Action	Target	Remarks	Remarks of Joint Committee
Iron Oxide residue sales	KMML invited e-tender for the sales of iron oxide residue for further process/value addition at end user on 19/12/2019. M/s Miracle sands and Chemicals, Tuticorin quoted for the tender and sales order was issued to the party on 09/06/2020, for shifting 10,000 MT to the end user end. Sales order of iron oxide sludge was extended for obtaining statutory approvals from TNPCB and KSPCB. M/s Miracle sands and chemicals, Tuticorin has already submitted a detailed project proposal for manufacturing Iron oxide concrete bricks along with the consent order from TNPCB valid up to March 2025 and the sale order of Iron oxide residue (10,000 MT) issued by KMML on 09/06/2020. In the meeting held on 19/09/2022 in KSPCB, Head Office, TVM, KMML requested KSPCB sanction to shift 10,000	18-24 months from the date of statutory clearance	CPCB concurrence to transfer trial quantity is in progress.	Necessary approval from Kerala State Pollution Control Board shall be obtained in accordance with the Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 as amended

Item	Action	Target	Remarks	Remarks of Joint Committee
	MT of iron oxide to carry out trial runs as per Hazardous and Other Waste (Management and Transboundary Movement) Rules 2016 chapter II, Section No.9, Sub division 2. KSPCB informed KMML that a letter has forwarded to CPCB on 24/09/2022 for seeking their advice on conducting a trial. KMML officials visited CPCB on 28/11/2022 and made follow up for obtaining authorization for trial production of Iron oxide bricks by M/s Miracle Sands and Chemicals, Tuticorin. CPCB officials informed that authorization request from KMML will be included in the next committee meeting held in January 2023.			
ETP sludge sales	E-tender was invited by KMML for shifting 10,000 MT of ETP sludge from ETP pond on 04/02/2020 and subsequently the quantity enhanced from 10000MT to 50000 MT on	Ongoing	8658.60 MT has been shifted and balance quantity shifting is in	Progress shall be reported by M/s KMML periodically to Kerala SPCB.

Item	Action	Target	Remarks	Remarks of Joint Committee
	17/02/2020. Sales order was issued to M/s Miracle sands and Chemicals on 09/06/2020 for 10,000 MT. A new sales order was issued to M/s Miracle sands and Chemicals for 40,000 MT on 08/04/2022.About 8658.60 MT of ETP sludge has been shifted by the party from KMML. Permission granted to M/s Miracle Sands & Chemicals from KSPCB for collection and transportation of ETP sludge from KMML valid up to 31/03/2023.		progress valid up to 31/03/2023.	
ETP Revamping/ Modernization	E tendering of ETP revamping / modernization DPR done on 10/02/2022. No offer received. Contacted parties for budgetary quote. The parties conveyed that they can proceed further only after signing an MOU. Being a public sector unit, KMML decided to go for retendering. E-tendering done for DPR preparation of ETP revamping/modernization. Three offers received and	Time frame set for draft DPR submission- DECEMBER 2022	After finalization of DPR, E-tendering will be done for ETP revamping/ modernization with necessary approvals.	Proposal for ETP upgradation as suggested by the Joint Committee need to be submitted to Kerala SPCB for approval.

Item	Action	Target	Remarks	Remarks of Joint Committee
	work order was awarded to M/s SBA Enviro System, Delhi and draft report will be submitted within a week.			
Capping of existing storage ponds	Tendering activities for capping of settling pond 1 eastern side area is under progress.	Time frame for tendering and capping Feb- 2023.	Tendering activities in progress.	Capping (as per guidelines of CPCB) Progress shall be reported periodically
Utilization of Iron oxide by making Iron sinter- value addition of iron oxide.	**In-house value addition of Iron oxide** Plant trial for a quantity 10 MT of iron oxide conducted on 23 rd Nov 2022. The trial was found successful and we were able to produce iron sinters. The sinters produced are chloride free and agglomerated, which was confirmed by outsourcing analysis at NIIST and STIC. The quality has to be confirmed by the prospective iron industry for using as raw material for iron industry.	Time frame for setting up of a plant in KMML December 2023.	We are providing samples to the different Iron industry for checking the suitability. Patent filed in 2022.	Necessary approvals from KSPCB/CPCB shall be obtained as required under the Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 as amended
Utilization of Iron oxide by making	Another plant trial for the production of DRI pellets from the iron oxide is	Time frame to be decided after the	Patent filed in 2022.	Necessary approvals from KSPCB/CPCB

Item	Action	Target	Remarks	Remarks of Joint Committee
DRI/Sponge pellets-value addition of iron oxide.	planned. If successful, further value addition of iron oxide is possible. Trial scheduled for third week of December 2022.	trial.		shall be obtained as required under the Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 as amended

5. Observations and Recommendations of the Joint Committee

As per observations of the Joint Committee, M/s KMML is not complying to the conditions of Integrated Consent issued under The Environment (Protection) Act 1986.

Also, *M/s KMML is still in the process of compliance to the directions issued on April 12, 2012, by CPCB under Section 5 of The Environment (Protection) Act 1986.*

Further, M/s KMML is still in the process of implementation of short term and long term measures.

Based on the appraisal of M/s. KMML on the status of implementation of the actions plans submitted earlier by M/s. KMML and additional measures are suggested for implementation in a time bound manner by M/s.KMML as detailed below :-

1. The remedial measures both short term and long term already proposed by M/s KMML shall be implemented ***within the committed time limit.***

2. The existing effluent treatment system shall be upgraded to ensure compliance to the effluent discharge norms prescribed under the consent conditions- ***within one year.***

3. Integrated Consent to Operate issued to M/s KMML by Kerala SPCB shall be amended suitably with the necessary effluent discharge norms and hazardous waste management in accordance with the prevailing rules notified under The Environment (Protection) Rules, 1986- ***within a month.***

4. Proper sign boards should be placed at all the suitable places to avoid human/ animal contact with the polluted stagnant water bodies in the vicinity of the human habitation- ***within a month.***

5. Permanent capping of the existing storage ponds or shifting of entire hazardous waste to the CHWTSDF located nearby should be done in accordance with the Hazardous & Other Waste (Management and Transboundary Movement) Rules, 2016 as amended as well as guidelines issued by CPCB for capping of hazardous waste, if iron oxide sludge is not utilised completely.

   Till such time, the existing old iron oxide ponds should be capped temporarily using LDPE liner (s) to avoid contaminated run off flow into the nearby low lying and residential areas. Suitable chemical dosage provision to neutralise run off also be made at all the end points of drains carrying run off, within the industry premises ***before next monsoon or by May 2023.***

6. Untreated effluent generated from industry premises shall not be discharged into any drain or natural drain. Also, surface run off from old iron oxide

ponds located within the industry premises should be stopped completely by way of constructing suitable size of a garland drain all along the industry premises and same may be connected to rainwater holding pond and excess flow to TS canal, provided free from contamination, ***within a period of nine months*** and along the periphery of old iron oxide ponds ***by March 2023***. Also, the runoff should be neutralised if required, and ensured if required suitable and proper treatment, before its discharge.

7. Among the process changes, feasibility of inclusion of wash water option for recovery of acid (which should be recycled in the process) and neutralisation of iron oxide sludge using suitable chemicals prior to the disposal of iron oxide sludge into storage tank –***within three months.***

8. Lime treatment in the existing dump yards and surface water contaminated areas as temporary measures shall be continued-***on going.***

9. Regular water supply and periodical health camps should be ensured by the company to the affected people-***on going.***

10. Existing iron oxide pond capacity is exhausted, the industry is required to take immediate action for temporary storage and its safe disposal in accordance with the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016 as amended ***with immediate effect.***

11. The R & D Options for utilisation of iron oxide sludge for recovery of iron through steel manufacturers required to be implemented within three months by obtaining requisite approvals from KSPCB and CPCB following the manifest as required under the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016 as amended, for which suitable

conditions to be imposed and amended under the approvals granted to the industry by KSPCB. Also, M/s.KMML may explore the option of recovery of red oxide from iron oxide sludge presently being followed by M/s DCW in Tamilnadu, ***within a period of three months***.

12. Detailed assessment of affected areas in the vicinity of M/s. KMML need to be ascertained through institute of repute and option of remediation of contaminated site as well as ground water as well as feasibility of acquisition of affected land i.e., contaminated land nearby premises of M/s.KMML also be explored and implemented, ***for which time bound action plan to be submitted by M/s.KMML.***

13. M/s. KMML also ensure compliance to the CPCB directions issued under Section 5 of The Environment (Protection) Act, 1986 in April 2012, for environmentally sound management of hazardous waste in accordance with the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016 as amended.

14. All the tube wells located within the industry premises shall be connected with tamper proof flow meter to record total water consumption of natural resources **within three months** and proper records to be maintained and submitted to Kerala SPCB on quarterly basis.

15. M/s. KMML is required to install OCEMS and also a flow meter at the effluent outlet discharge into sea to assess compliance to the effluent discharge norms prescribed under the Integrated Consent to Operate issued by Kerala SPCB under The Environment (Protection) Act, 1986. Also, OCEMS should be connected to Kerala SPCB server and also displayed at the entrance

of the industry for information of general public, **within five months.**

M/s. KMML shall ensure implementation of all the action plans as per time bound action plan suggested by the Joint Committee and Kerala State Pollution Control Board shall monitor periodically.

Submitted for kind consideration of this Hon'ble National Green Tribunal.

(Suman Billa)
Principal Secretary
Industries and NORKA Department

(S.Sreekala)
Chief Environmental Engineer
KSPCB, Thiruvananthapuram

(Afsana Perween)
District Collector
Kollam

(J.Chandra Babu)
Regional Director
CPCB, Bengaluru

(Dr. John C. Mathew)
Environment Programme Manager,
Directorate of Environment and Climate Change
Representing State Wetland Authority Kerala

Item No.11 (Court No. 2)

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH

(By Video Conferencing)
Original Application No.502/2022

Padmakumar ...Applicant

Versus

State of Kerala ...Respondent

Date of hearing: 29.08.2022

CORAM: HON'BLE MR. JUSTICE ARUN KUMAR TYAGI, JUDICIAL MEMBER
HON'BLE DR. AFROZ AHMAD, EXPERT MEMBER

Application is registered based on a Letter Petition received by Email.

ORDER

1. Padmakumar S resident of Kochuveettil, Mullakkeri Panmana, Manayil PO, Kannathu District, Kollam, Kerala has sent the present letter petition, which is treated and registered as original application, complaining that Kerala Minerals and Metals Ltd. (KMML) Chavara in village Pamana of Kollam District of Kerala is polluting the land and water bodies for about 30 years by discharging acid water. The area surrounding the factory has become unfit for any purpose. 15 families are residing close to the acid collecting tank of company. The villagers were forced to close drinking water wells which were filled with acid. Cultivation is also not possible in the area. Lots of coconut trees fell due to corroded land. The industry is pumping acid waste directly to sea and connected lake through canals. Vattakkayal, a part of Ashtmudi, Vembanad lake in Porookkara is now filled with the acid clay waste polluting the environment and endangering life of the villagers.

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE

SREEKALA S.
Chief Environmental Engineer

2. This Tribunal is empowered to *suo moto* take cognizance of the cases involving questions relating to environment arising out of the implementation of enactments specified in First Schedule of the National Green Tribunal Act, 2010 as held by Hon'ble Supreme Court in ***Municipal Corporation of Greater Mumbai V/s. Ankita Sinha and others 2021 SSC Online SC 897***. This Tribunal can also take cognizance of such cases on the basis of letter petitions in accordance with settled principles of law governing Public Interest Litigation.

3. *Prima facie*, the allegations made in the application raise questions relating to environment arising out of the implementation of the enactments specified in Schedule I to the National Green Tribunal Act, 2010. In view of the allegations made in the application, we consider it appropriate that a Joint Committee be constituted to verify the factual position. Accordingly, we constitute a Joint Committee comprising of Principal Secretary (Industries & NORKA), Government of Kerala, CPCB, State PCB, State Wet Land Authority and Collector, Kollam and direct the same to meet within two weeks, undertake visits to the site, look into the grievances of the applicant, associate the applicant and representative of the concerned project proponent, verify the factual position and submit its report within one month by e-mail at judicial-ngt@gov.in preferably in the form of searchable PDF/OCR Supported PDF and not in the form of Image PDF. The State PCB will be the nodal agency for coordination and compliance.

4. In case the Joint Committee observes any violation of consent conditions/environmental norms then it shall forward a copy of its report to

(i) Project Proponent to enable it to comply with the recommendations in its report or file objections against the observations/recommendations in the report of the Joint Committee and file its response before this Tribunal as desired within one month

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer

from the date of receipt of a copy of the report of the Joint Committee; and

(ii) Principal Secretary (Industries & NORKA), Government of Kerala, State PCB, State Wet Land Authority and Collector, Kollam to enable them to take appropriate remedial action by giving notice to/hearing the project proponent and following due process of law in accordance with Statutory provisions mandating them to take remedial action for prevention, control and abatement of environmental pollution/degradation and protection and improvement of environment and submit their action taken report within one month from the date of receipt of a copy of the report of the Joint Committee.

5. List for further consideration on 13.12.2022.

6. A copy of this order, along with a copy of the application and documents attached with the same, be forwarded to the Principal Secretary (Industries & NORKA), Government of Kerala, CPCB, State PCB, State Wet Land Authority and Collector, Kollam by e-mail for compliance.

Arun Kumar Tyagi, JM

Dr. Afroz Ahmad, EM

August 29, 2022
AG

KERALA STATE POLLUTION CONTROL BOARD
REGIONAL OFFICE

SREEKALA S.
Chief Environmental Engineer

Item No.2 (Court No. 2)

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

(Through Physical Hearing with Hybrid VC Option)
Original Application No.502/2022

Padmakumar ...Applicant

Versus

State of Kerala ...Respondent

Date of hearing: 13.12.2022

CORAM: HON'BLE MR. JUSTICE ARUN KUMAR TYAGI, JUDICIAL MEMBER
HON'BLE DR. AFROZ AHMAD, EXPERT MEMBER

Applicant: Mr. Arun Chand, Advocate (through VC).

Respondents: Mr. Nishe Rajen Shonker and Mr. Alim Anuar, Advocates for State of Kerala.
Mr. Keerthi Priyan. E, Advocate for Mr. Jogy Scaria, Advocate for Kerala State Pollution Control Board.

Application is registered based on a Letter Petition received by Email.

ORDER

1. Padmakumar S resident of Kochuveettil, Mullakkeri Panmana, Manayil PO, Kannathu District, Kollam, Kerala has sent the present letter petition, which is treated and registered as original application, complaining that Kerala Minerals and Metals Ltd. (KMML) Chavara in village Pamana of Kollam District of Kerala is polluting the land and water bodies for about 30 years by discharging acid water. The area surrounding the factory has become unfit for any purpose. 15 families are residing close to the acid collecting tank of company. The villagers were forced to close drinking water wells which were filled with acid. Cultivation is also not possible in the area.

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE

SREEKALA S.
Chief Environmental Engineer

Lots of coconut trees fell due to corroded land. The industry is pumping acid waste directly to sea and connected lake through canals. Vattakkayal, a part of Ashtmudi, Vembanad lake in Porookkara is now filled with the acid clay waste polluting the environment and endangering life of the villagers.

2. Vide order dated 29.08.2022, this Tribunal constituted a Joint Committee comprising of Principal Secretary (Industries & NORKA), Government of Kerala, CPCB, State PCB, State Wet Land Authority and Collector, Kollam and directed the same to submit factual and action taken report within one month and send the copies of the report of the Joint Committee to the Project Proponent/Statutory Authorities.

3. In compliance thereof, Mr. Sreekala S, Chief Environmental Engineer has submitted report of the Joint Committee vide email dated 29.11.2022.

4. In its report, the Joint Committee has submitted that the water and sludge samples taken from the industrial unit and its premises were taken to Central Laboratory, KSPCB, Ernakulam for processing and thereafter digested samples (21 Nos) were sent to Regional Lab of Regional Directorate, CPCB, Bengaluru for further analysis. As per the decision of the Joint Committee, the final report shall be prepared and submitted before this Tribunal at the earliest after obtaining the analysis result of the samples, sludge samples and samples of stagnant water near the industry premises collected during the visit of Joint Committee on 17.10.2022.

5. The Joint Committee is directed to submit its further report by 31.01.2023 by email at judicial-ngt@gov.in preferably in the form of searchable PDF/OCR Supported PDF and not in the form of Image PDF.

6. In view of the averments made in the application and observations made in the report of the Joint Committee, we consider it appropriate to

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer

have response of (1) State of Kerala through Chief Secretary, Government of Kerala, (2) Principal Secretary, Department of Industries & NORKA, State of Kerala, (3) State PCB, (4) Member Secretary, Kerala State Wetland Authority, (5) the District Collector, Kollam, and (6) the Project Proponent- M/s Kerala Minerals and Metals Ltd., who stand impleaded as respondents No. 1 to 6. The Registry is directed to prepare and attach memo of parties to the application and issue notices to respondents No. 1 to 6.

7. Notice requiring filing of reply/response within two months be served on the Project Proponent- M/s Kerala Minerals and Metals Ltd. through the District Collector, Kollam and for this purpose notice issued to the Project Proponent be sent to the District Collector, Kollam by E-mail for getting service of the same effected on it and sending his report in this regard.

8. Mr. Nishe Rajen Shonker and Mr. Alim Anuar, Advocates accept notice on behalf of respondents no. 1, 2, 4 and 5 and Mr. Keerthi Priyan. E, Advocate accepts notice on behalf of respondent no. 3 and they seek time to file reply/response on behalf of respondents no. 1 to 5.

9. Reply/response by respondents no. 1 to 6 be filed within two months by email at judicial-ngt@gov.in preferably in the form of searchable PDF/OCR Supported PDF and not in the form of Image PDF.

10. In view of the observations made in the report of the Joint Committee and environmental statutory enactments casting obligations on the State and its instrumentalities and State Pollution Control Board to protect and improve environment, the respondents no. 1 to 5 are also directed to take appropriate remedial measures and also file Action Taken Report alongwith their reply/response within two months as directed above.

11. List for further consideration on 06.03.2023.

SREEKALA S.
Chief Environmental Engineer

12. A copy of this order be sent to the District Collector, Kollam for requisite compliance for effecting service of notice on the project proponent and sending his report to this Tribunal

Arun Kumar Tyagi, JM

Dr. Afroz Ahmad, EM

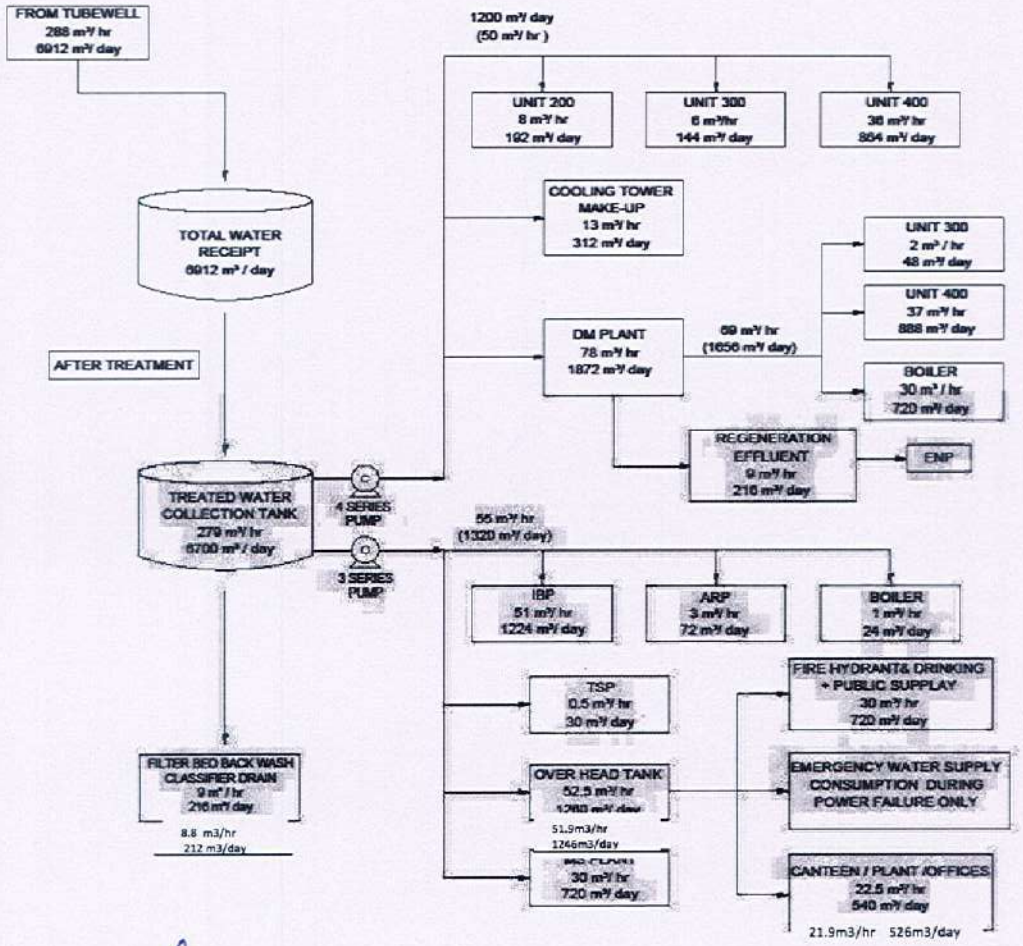
December 13, 2022
AG

KERALA STATE POLLUTION CONTROL BOARD
REGIONAL OFFICE
THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer

WATER CONSUMPTION DIAGRAM

6



KERALA STATE POLLUTION CONTROL BOARD
REGIONAL OFFICE
THIRUVANANTHAPURAM

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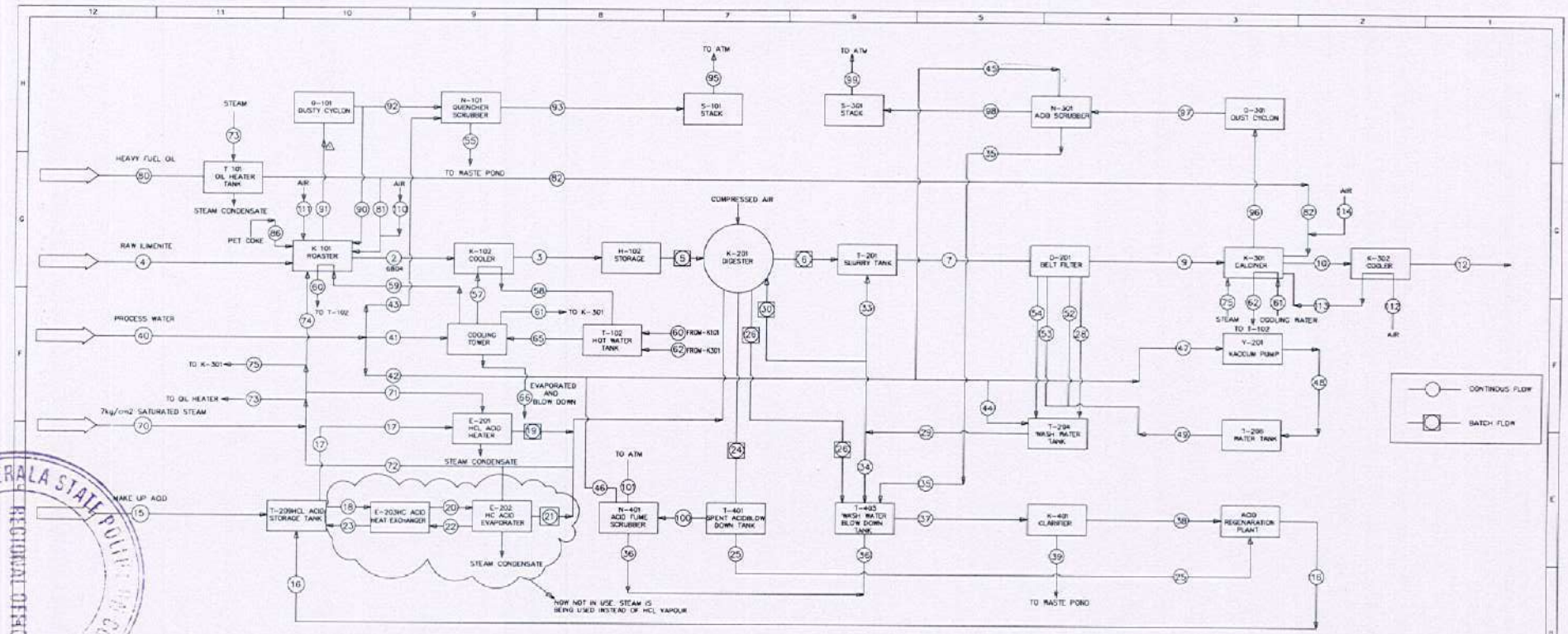
SREEKALA S.
Chief Environmental Engineer



STREAM NO.		1	2	3	4	5	6	7	9	10	12	15	16	17	18	19	20	21	22	23	24	25	26	28	29	30	33	34	35	36	37	38	39
SOLID	kg/hr		6804	6804	6917	6804	4157	4157	4157	4157	4157										91	91	91								91		91
LIQUID	kg/hr				35		1826	12471	1122	21	21	546	17579	16152	2955	16152	2955	1970	985	985	18543	18159	8318	19203	26325	8100			618	1548	18684	15494	2500
TOTAL RATE	kg/hr		6804	6804	6952	6804	5983	16628	5278	4178	4178	546	17579	16152	2955	16152	2955	1970	985	985	18634	18241	8409	19203	26325	8100	10943		618	1548	18775	15494	2591
% SOLID			100	100	99.5	100	69.48	25	78.75	99.5	99.5										0.49	0.5	1.08								0.05		3.36
TEMPERATURE °C			850	150	25	25	64	40	40	650	121	25	60	60	60	95	86	143	143	92	143	110	84	40	40	40	40	40	70	85	54	50	50
S.G.SOLID(BULK)			2.36	2.36	2.36	2.36	1.49	1.49	1.49	1.48	1.49										1.49	1.49	1.49								1.49		1.49
S.G. LIQUID					1		1.02	1.02	1.02	1.02	1.02	1.16	1.12	1.12	1.12	1.1	1.11	VAPOUR	1.05	1.1	1.26	1.26	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
TOTAL RATE	M³/hr		2.88	2.88	2.93	2.88	2.79	13.13	2.79	2.8	2.8	0.47	15.69	14.42	2.64	14.68	2.66	865000(kg/m³)	0.94	0.9	14.74	14.42	18.28	18.83	25.81	7.94	10.44	7.43	0.61	1.54	12.75	15.18	2.57

WATER

STREAM NO		40	41	42	43	44	45	46	47	48	49	52	53	54	55	57	58	59	60	61	62	65	66
WATER	kg/hr	22932	3605	17392	1735	6000	1001	1415	8976	8976	8976	7854	1122	1122	1378	5800	5800	6800	6800	6800	6800	72300	3805
TEMPERATURE° C		35	35	35	35	35	35	35	35	35	35	35	35	40	70	35	50	35	50	35	50	50	50
FLOW RATE	M³/hr	22.93	3.61	17.39	1.74	6	1	1.42	8.98	8.98	8.98	7.85	1.12	1.12	1.38	5.8	5.8	6.8	6.8	6.8	6.8	72.3	3.81

BATCH FLOW RATE

STREAM NO		5	6	19A ST LEACH	19B ST LEACH	21A ST LEACH	21B ST LEACH	24A ST LEACH	24B ST LEACH	248 ST LEACH	26	30
TOTAL	kg/BATCH	42000	36935	52808	46912	7808	4545	57269	57756	51907	50000	
OPERATING RATE	kg/hr	100800	78370	70403	70403	6100	6100	69300	69300	69200	75000	
OPERATING RATE	M³/hr	42.71	34.44	64	64	2678	2678	54.82	54.82	67.84	73.53	

STEAM

STREAM NO		70	71	72	73	74	75
STREAM	kg/hr	4900	1400	2925	25	125	125
STREAM	MT/hr	4.3	1.4	2.63	0.03	0.13	0.13

AIR

STREAM NO		110	111	112	113	114
AIR	kg/hr	2342	1727	7384	7384	837
TEMPERATURE °C		25	25	25	242	25
FLOW RATE	M³/MIN	32.91	24.27	103.76	179.32	11.76
FLOW RATE	M³/MIN	30.15	22.23	95.06	95.06	10.77

GAS

STREAM NO		90	91	92	93	95	96	97	98	99	100	101
GAS	kg/hr	1319	6225	4910	5287	5267	9983	9685	10068	10068		
TEMPERATURE° C		316	316	316	>100	92	182	182	85	89		
FLOW RATE	M³/hr	40.15	190.06	149.91	165.72	193.45	224.25	224.25	187.48	184.8	11.2	6.8
FLOW RATE	NM³/MIN	18.61	88.09	69.48	77.38	77.38	134.55	134.55	142.98	142.91	7.99	4.98

OIL

STREAM NO		80	81	82
OIL	kg/hr	481	173	248
TEMPERATURE	°C	55	80	80
	M³/hr	0.5	0.18	0.26

PET COKE

STREAM NO		86
WET PET COKE	kg/hr	695

ITEM/ COMPONENT	RAW/ ELMENTS	BENEFICIATED/ ELMENTS	ITEM/ COMPONENT	MAKE UP ACID	RECEIVER ACID	SPENT ACID	WASH WATER	CLARIFIER UNDER FLOW	ITEM/ COMPONENT	ROASTER STEAM GAS	CALCINER STEAM GAS	IRON SCRUBBER EFFLUENT GAS
	4	12		15	16	25	38	39		95	96	100
	WT%	WT%		WT%	WT%	WT%	WT%	WT%		VOL%	VOL%	VOL%
TiO2	58.83	92.5	TiOSO4		0.01	0.29	0.03	0.03	O2	3.53		
FeO	12.34		FeSO4		3.71	18.31	1.64	1.64	CO2	14.35	4.64	
Fe2O3	23.32	5.5	FeCl3		1.86	4.88	0.67	0.67	N2	55.88	58.19	
MnO	0.9	0.1	MnSO4		0.26	0.74	0.08	0.08	O2	0.36	9.07	
MgO	2	0.3	MgSO4			1.48	0.15	0.15	H2O	26.07	28.08	99.93
CaO			CaSO4						SO2	0.01	0.01	
Al2O3	0.6	0.6	AlCl3		0.03	0.24	0.03	0.03	HCL		0.01	0.07
Cr2O3	0.1	0.1	CrCl3			0.03	0.01	0.01	TOTAL	100	100	100
V2O5	0.07	0.05	VoCl3			0.03	0.01	0.01				
P2O5			PoCl5									
SiO2	1.2	2	SnCl4									
ZrO2	0.07	0.11										
Nb2O5	0.18	0.25										
SnO2												
Xo	0.01	0.18	XCO									
AM		0.5	HCL	31.5	18.61	3.31	0.62	0.62				
TOTAL	100	100	H2O	68.5	77.5	70.09	98.78	98.78				
H_2O	0.5	0.5	TOTAL	100	100	100	100	100				
			FINE			0.30		3.50				

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CLIENTS M/s KMML-CHAVARA

DRAWING NO.	TITLE	REFERENCE DRAWING

NO.	ZONE	REVISION				
1		AS MARKED	MAHESH	KVK	CVR	08-12-14
		REVISIONS	REVISED	CHECKED	APPROVED	DATE

SCALE NTS
DATE 19-05-14
DRAWN MAHESH
CHECKED JJ
DESIGNED JJ
CHECKED KVK
APPROVED CVR

FACT ENGINEERING & DESIGN ORGANISATION
THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL KERALA

PROJECT NAME STUDY OF TITANIUM DIOXIDE PIGMENT PLANT PROJECT No: 8139

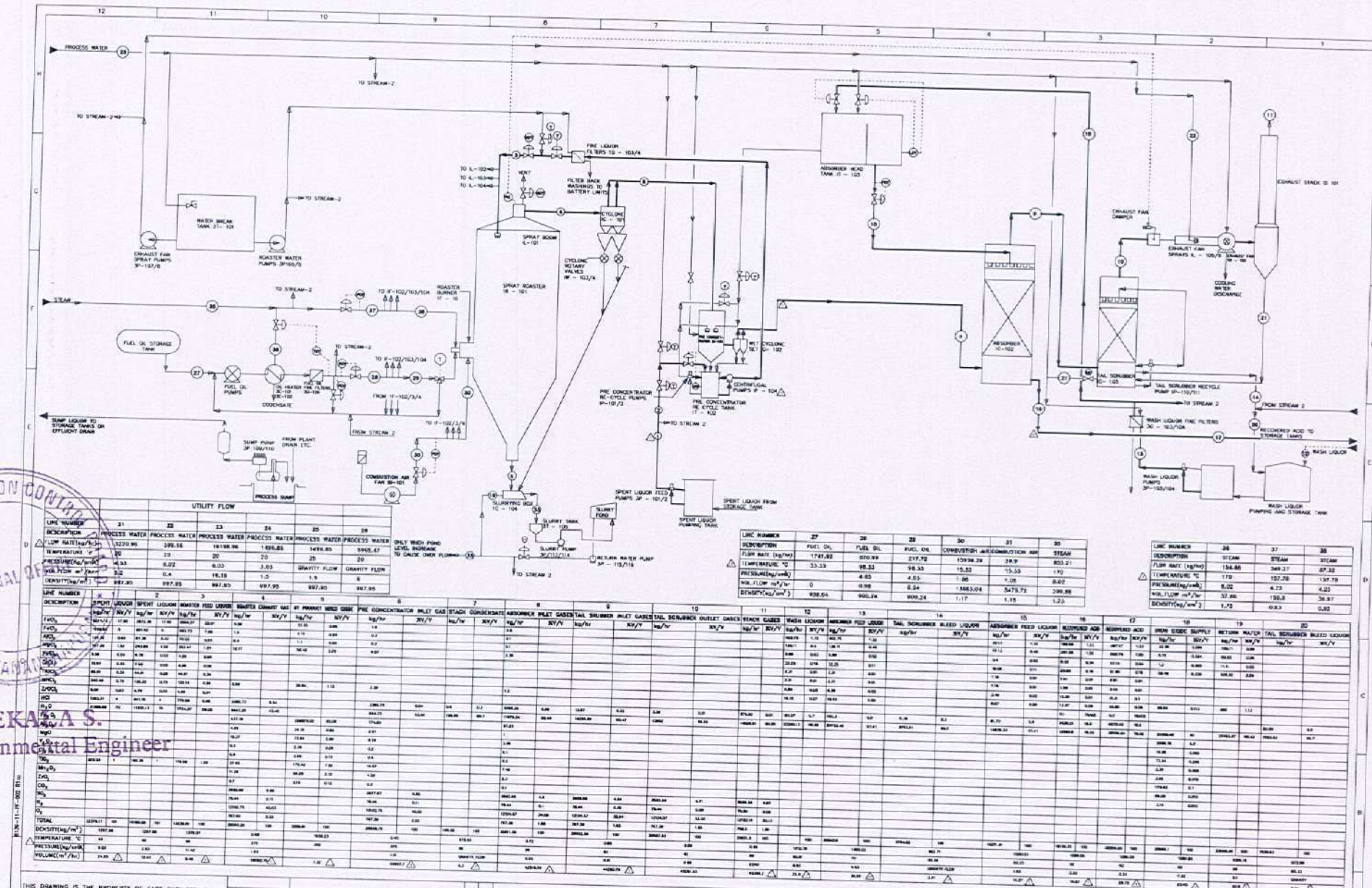
TITLE IBP PLANT MATERIAL BALANCE FOR SINGLE STREAM,1000TPD (PLANT HAVE TWO STREAMS)

SHEET 1 OF 1 DRC. No. 8139-11-PF-001 REV. 1

A1

8139-11-PF-001rR1

SREEKALA S.
Chief Environmental Engineer



UTILITY FLOW

LINE NUMBER	21	22	23	24	25	26
DESCRIPTION	PROCESS WATER	PROCESS WATER	PROCESS WATER	PROCESS WATER	PROCESS WATER	PROCESS WATER
FLOW RATE(kg/hr)	3229.96	385.16	19198.96	1496.85	3496.85	5905.47
TEMPERATURE °C	20	20	20	20	25	20
PRESSURE(kg/cm²)	4.53	6.02	6.03	3.83	GRAVITY FLOW	GRAVITY FLOW
VOL.FLOW m³/hr	3.2	0.4	19.19	1.5	3.5	6
DENSITY(kg/m³)	997.95	997.95	997.80	997.95	997.80	997.95

LINE NUMBER	27	28	29	30	31	32
DESCRIPTION	FUEL OIL	FUEL OIL	FUEL OIL	COMBUSTION AIR	COMBUSTION AIR	STEAM
FLOW RATE (kg/hr)	1741.93	1741.93	1741.93	15938.28	15938.28	855.21
TEMPERATURE °C	33.33	33.33	217.72	39.9	39.9	179
PRESSURE(kg/cm²)		33.33	33.33	15.53	15.53	7.70
VOL.FLOW m³/hr	0	2.18	4.83	1.86	1.08	0.62
DENSITY(kg/m³)	938.64	938.64	1883.04	1.17	1.15	1.25

LINE NUMBER	36	37	38
DESCRIPTION	STEAM	STEAM	STEAM
FLOW RATE (kg/hr)	134.88	369.27	87.32
TEMPERATURE °C	179	157.78	157.78
PRESSURE(kg/cm²)	8.02	6.23	4.23
VOL.FLOW m³/hr	57.86	158.8	36.87
DENSITY(kg/m³)	1.72	0.93	0.82

LINE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
DESCRIPTION	SPENT LIQUOR	SPENT LIQUOR	ROASTER FEED LIQUOR	ROASTER EXHAUST GAS	AT PRIMARY HEAD SIDE	PRE CONCENTRATOR INLET GAS	STACK CONDENSATE	ABSORBER INLET GASES	TAIL SCRUBBER INLET GASES	TAIL SCRUBBER OUTLET GASES	STACK GASES	WASH LIQUOR	ABSORBER FEED LIQUOR	TAIL SCRUBBER BLEED LIQUOR	ABSORBER FEED LIQUOR	RECOVERED ACID	RECOVERED ACID	WEAK ACID SUPPLY	RETURN WATER	TAIL SCRUBBER BLEED LIQUOR
	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr	kg/hr
TOTAL	3229.17	385.16	19198.96	1496.85	3496.85	5905.47	3229.96	385.16	19198.96	1496.85	3496.85	5905.47	3229.96	385.16	19198.96	1496.85	3496.85	5905.47	3229.96	385.16
DENSITY(kg/m³)	1297.38		1297.38		1295.37															
TEMPERATURE °C	43		95		50															
PRESSURE(kg/cm²)	0.03		0.83		11.42															
VOLUME(m³/hr)	24.89		12.43		0.48															

CLIENTS: M/s KMML-CHAVARA

DRAWING NO. | TITLE: REFERENCE DRAWING

NO	ZONE	REVISION
1		AS MARKED

MAHESH	KVK	CVR	08-12-14	DESIGNED
REVISED	CHECKED	APPROVED	DATE	DRAWN

SCALE	NTS
DATE	10-01-14
DRAWN	MAHESH
CHECKED	JJ
DESIGNED	JJ
DRAWN	KVK
APPROVED	CVR

A1

FACT ENGINEERING & DESIGN ORGANISATION
THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL KERALA

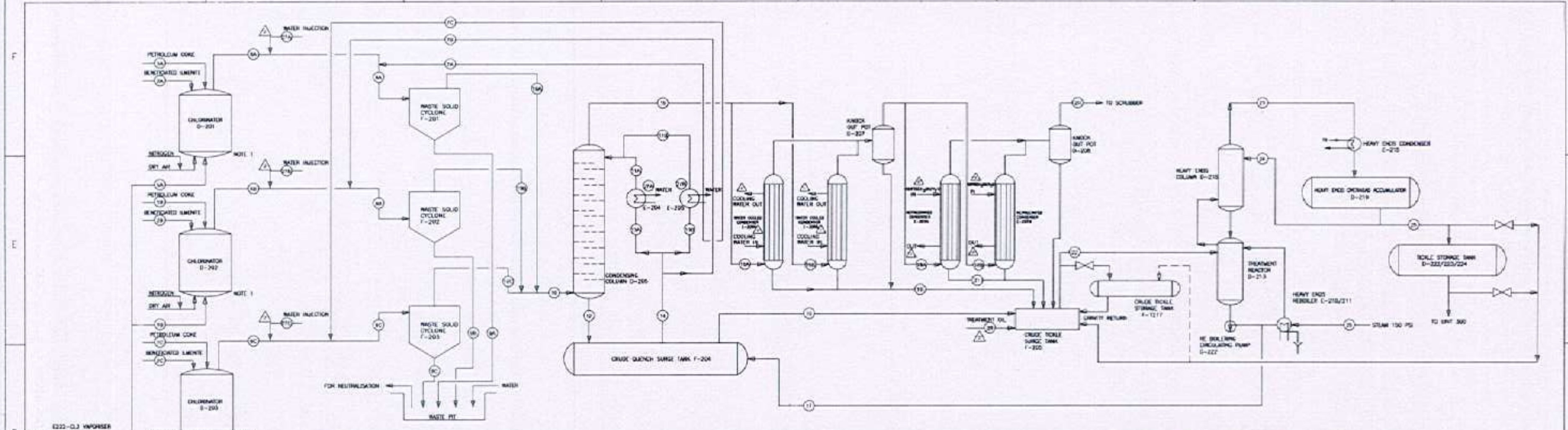
FEDO

PROJECT NAME: STUDY OF TITANIUM DIOXIDE PIGMENT PLANT PROJECT No: 8139

TITLE: ACID REGENERATION PLANT-MATERIAL BALANCE
(PLANT HAVE TWO STREAMS EACH CAPABLE OF PROCESSING 12.5 m³/hr OF SPENT LIQUOR)

SHEET 1 OF 1 | DRG. No. 8139-11-PF-002 | REV. 1

8139-11-PF-002 R1(a)



NOTE 1 :- TWO CHLORINATORS WILL BE ONLINE

CLIENTS M/s KMML-CHAVARA

No	ZONE	PARTICULARS	REVISED	CHECKED	APPROVED	DATE
2		AS MARKED	MAHESH	KVK	CVR	12-12-14
1		AS MARKED	MAHESH	KVK	CVR	06-12-14

DRAWING No: / REFERANCE — REVISION

SCALE	NTS
DATE	10-01-14
DRAWN	MAHESH
CHECKED	JJ
DESIGNED	VSM
CHECKED	KVK
APPROVED	CVR

FACT ENGINEERING & DESIGN ORGANISATION
THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL KERALA

FEDO

PROJECT NAME STUDY OF TITANIUM OXIDE PIGMENT PLANT PROJECT No: 8139

TITLE UNIT 200 CHLORINATOR SECTION MATERIAL BALANCE (276TPD TICKLE PRODUCTION)

SHEET NO 1 OF 1 DRG. No. 8139-11-PF-003 REV.2

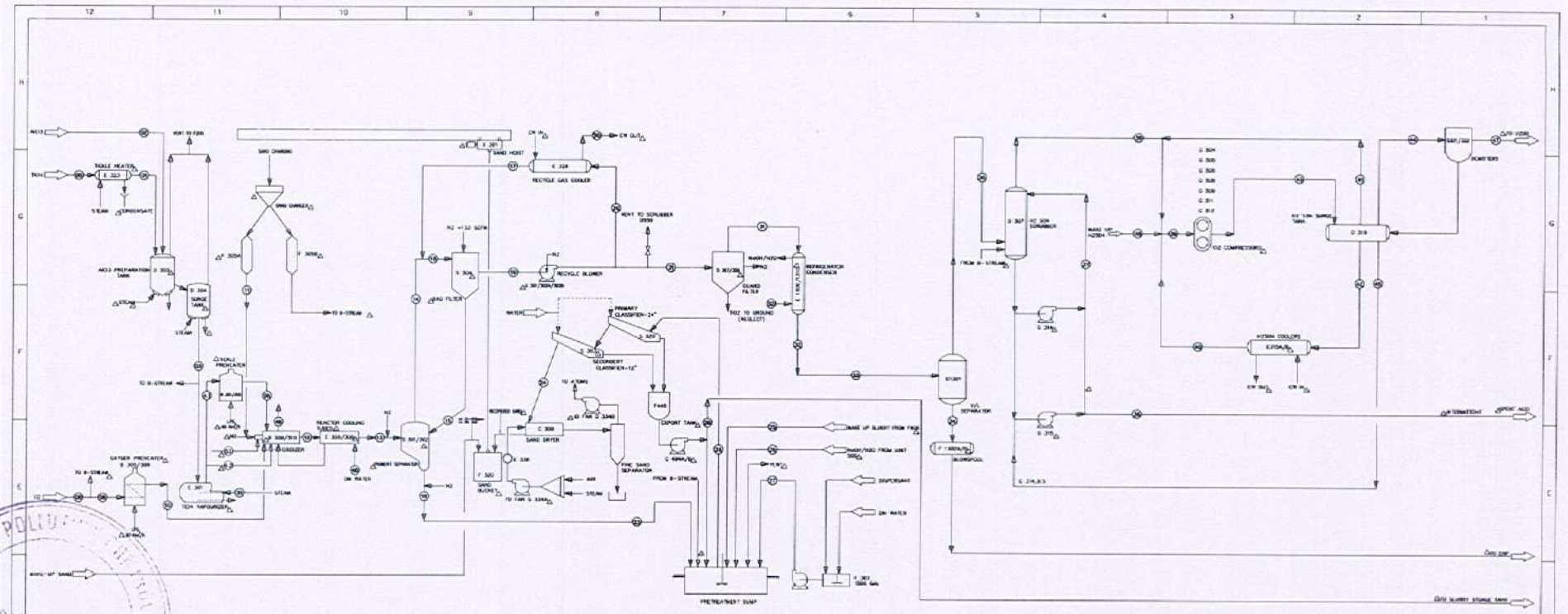
A3

00FT006/2010

<8139-11-PF-003>

REGIONAL OFFICE KERALA STATE POLLUTION CONTROL BOARD THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer



NOTES :-

FOR THE CORRESPONDING REFERNCE TABLE & THE NOTES REFFER DRG 8139-11-PF-004 2 OF 2

KERALA STATE POLLUTION CONTROL BOARD
REGIONAL OFFICE
THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer

										SCALE	NTS
										DATE	10-01-14
										DRAWN	MAHESH
										CHECKED	JJ
			1	AS MARKED	MAHESH	JJ	JJ	04-12-14	DESIGNED	JJ	
DRAWING NO.	TITLE		NO	ZONE	PARTICULARS	BY/SEE	CHECKED	APPROVED	DATE	CHECKED	KSR
	REFERENCE DRAWING				REVISION					APPROVED	CVR

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CLIENTS: M/s KMML-CHAVARA

FACT ENGINEERING & DESIGN ORGANISATION
THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL KERALA

FEDO

PROJECT NAME: STUDY OF TITANIUM DIOXIDE PIGMENT PLANT — PROJECT No: 8139

TITLE: OXIDATION SECTION U-300 PROCESS MATERIAL BALANCE

SHEET 1 OF 2 | DRG. No. 8139-11-PF-004 | REV. 1

A2

8139-11-PF-004 1 OF 2

DP7005/2010

100

STREAM NO:	0		1		2		3A		4.1A		4.2A		5A		6		8A	
	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	Nm³/h	kmol/h	Nm³/h	kmol/h	Nm³/h	kmol/h	Nm³/h	kmol/h	Nm³/h
$TiCl_4$	67.61	12824.14	67.61	12824.14			33.80	6412.07	27.47	615.63	6.34	142.07	27.47	615.63				
$AlCl_3$					0.26	34.31	0.13	17.26	0.11	2.36	0.02	0.54	0.11	2.36				
H_2O/STEAM																		
O_2															86.37	1936.04	43.19	968.02
N_2													0.680	15.23				
Cl_2																		
RAW TiO_2																		
Al_2O_3																		
HCl																		
SAND																		
H_2SO_4																		
$TiOSO_4$																		
LPG																		
TOTAL	67.61	12824.14	67.61	12824.14	0.26	34.31	33.93	6429.32	27.57	617.99	6.36	142.61	28.23	633.24	86.37	1936.04	43.19	968.02
ENERGY,Gcal/h	0.09		0.31		0.00		0.12		0.32		0.08		0.56		0.02		0.02	
TEMPERATURE,°C	37.78		132.22		26.67		116.73		163.33		163.33		450.00		26.67		29.44	
PRESSURE,kg/cm² G	0.01		0.01		0.01		0.98		0.84		0.84		0.35		2.11		0.56	
RATIO	2.43					0.001		2.44							0.52			

STREAM NO:	10A		11A		12A		13A		14A		15A		16A		17A		18A		19A		20A		21A	
	kmol/h	Nm³/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	Nm³/h	kmol/h	Nm³/h	kmol/h	Nm³/h	kmol/h	Nm³/h	kmol/h	Nm³/h
$TiCl_4$					0.83	160.30	0.85	160.30	0.85	160.30					1.39	31.19	2.24	50.15	2.24	50.15	1.39	31.19	0.85	18.94
$AlCl_3$																								
H_2O/STEAM																								
O_2	43.19	968.02			10.60	339.20	10.60	339.20	10.60	339.20					17.45	391.23	28.06	628.83	28.06	628.83	17.45	391.23	10.60	237.39
N_2					0.68	19.05	0.68	19.08	2.00	56.06					11.46	256.86	13.46	301.84	28.40	637.85	11.45	256.69	17.01	381.29
Cl_2					65.16	4621.37	65.16	4621.37	65.16	4621.37					107.32	2405.51	172.90	3864.37	172.90	3866.37	107.32	2405.51	65.16	1460.86
RAW TiO_2			0.05	4.38	32.96	2632.38	32.96	2632.38	4.94	394.65	4.94	394.65	32.96	2632.38			4.94							
Al_2O_3					0.06	6.60	0.06	6.60	0.01	0.99	0.01	0.99	0.06	6.60			0.01							
HCl					1.88	68.57	1.88	68.57	1.88	68.37					2.09	64.20	4.99	111.23	4.99	111.23	3.09	68.20	1.88	42.03
SAND				183.79		183.70		183.76						182.70										
H_2SO_4				183.19																				
$TiOSO_4$																								
LPG																								
TOTAL	43.19	968.02	0.05	187.76	112.20	8050.96	112.20	8030.96	85.45	5641.78	4.95	395.64	33.02	2822.08	140.71	3153.65	226.16	4856.10	236.21	5294.51	140.71	3155.63	95.51	2140.66
ENERGY,Gcal/h	0.35		6.00				0.73		0.38		0.01		0.26		0.66		0.26		0.25		0.18		0.12	
TEMPERATURE,°C	950.00		93.33				565.38		476.83		137.78		476.83		94.44		137.78		126.11		157.22		157.22	
PRESSURE,kg/cm² G	0.56						0.16		0.16										0.07		0.42		0.42	
RATIO				6.02																				

STREAM NO:	31A		32A		33A		*34		*35		36		37		38		39		40		41	
	kmol/h	Nm³/h	kmol/h	Nm³/h	kmol/h	Nm³/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	Nm³/h	kmol/h	kg/h	kmol/h	Nm³/h
$TiCl_4$	0.85	18.94	0.85	18.94	0.85	18.94	0.17	31.87	1.32	[illegible]	0.43						0.43	9.73				
$AlCl_3$																						
H_2O/STEAM															6.52	117.52	[illegible]	[illegible]				
O_2	10.60	237.39	10.60	237.39	10.60	237.39			21.20	678.39	21.20						23.19	519.29			1.99	44.01
N_2	17.01	381.29	17.01	381.29	17.01	381.29			34.02	953.03	34.02						[illegible]	[illegible]			[illegible]	[illegible]
Cl_2	65.16	1460.86	65.16	1460.86	65.16	1460.86			130.30	9242.74	130.30						131.60	[illegible]			21.33	[illegible]
RAW TiO_2																						
Al_2O_3																						
HCl	1.88	42.03	1.88	42.03	1.88	42.03			3.75	136.73	0.14				0.03	1.09	[illegible]	[illegible]			[illegible]	[illegible]
SAND																						
H_2SO_4													[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
$TiOSO_4$															1.52	[illegible]						
LPG																						
TOTAL	95.51	2140.66	95.51	2140.66	95.51	2140.66	0.17	31.87	190.59	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
ENERGY,Gcal/h	[illegible]		-0.071		-0.071		-0.006		-0.022		-0.013							[illegible]		[illegible]		[illegible]
TEMPERATURE,°C	[illegible]		10.00		10.00		10.00		10.00		10.56			32.43		32.43		[illegible]		41.33		[illegible]
PRESSURE,kg/cm² G	[illegible]		0.09		0.08		0.08		0.06		0.01						*INCLUDES [illegible]					8.11
RATIO																						

STREAM NO:	42		43		44		45		46		47		48		49		50		51		52		53	
	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	Nm³/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h
$TiCl_4$			0.43																					
$AlCl_3$																								
H_2O/STEAM			8.05				7.07	127.27	8.05	144.88								[illegible]		[illegible]				
O_2			23.19		21.20	[illegible]					21.20	[illegible]												
N_2			[illegible]		34.02	953.03					34.02	[illegible]												
Cl_2			[illegible]		130.30	9242.74					130.30	[illegible]												
RAW TiO_2																								
Al_2O_3																								
HCl			[illegible]		[illegible]	[illegible]					[illegible]	[illegible]												
SAND																								
H_2SO_4	[illegible]	[illegible]	[illegible]				[illegible]	[illegible]	27.88	[illegible]														
$TiOSO_4$							[illegible]																	
LPG																							1.32	[illegible]
TOTAL	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]		[illegible]	[illegible]	[illegible]		[illegible]			1.32	[illegible]
ENERGY,Gcal/h		[illegible]		[illegible]		[illegible]				[illegible]		[illegible]						[illegible]		[illegible]				[illegible]
TEMPERATURE,°C		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]	[illegible]	[illegible]		207.00		[illegible]		[illegible]
PRESSURE,kg/cm² G				[illegible]		[illegible]						2.04		[illegible]				[illegible]		[illegible]		[illegible]		[illegible]
RATIO																								

STREAM NO:	*23		24		25		26		27		28		29	
	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h	kmol/h	kg/h
H_2O/STEAM				[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]
NaOH								[illegible]						
DISPERSANT										[illegible]				
RAW TiO_2	[illegible]	[illegible]		[illegible]		[illegible]						[illegible]		[illegible]
Al_2O_3	[illegible]	[illegible]				[illegible]						[illegible]		[illegible]
HCl														
SAND		[illegible]		[illegible]										
H_2SO_4														
$TiOSO_4$														
TOTAL	[illegible]	[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]		[illegible]

1.0 BASIS
[illegible]
2.0 ASSUMPTION
[illegible]
3.0 UTILITIES
[illegible]
4.0 [illegible]
5.0 [illegible]

NOTES :-
[illegible]

CLIENTS: M/s KMML-CHAVARA

NO	ZONE	PARTICULARS	REVISED	CHECKED	APPROVED	DATE
2		AS MARKED	MAHESH	KSR	CVR	15-12-14
1		AS MARKED	MAHESH	KSR	CVR	04-12-14

SCALE: NTS | DATE: 10-01-14 | DRAWN: MAHESH | CHECKED: JJ | DESIGNED: JJ | CHECKED: KSR | APPROVED: CVR

FACT ENGINEERING & DESIGN ORGANISATION
THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL KERALA
FEDO

PROJECT NAME: STUDY OF TITANIUM DIOXIDE PIGMENT PLANT — PROJECT No: 8139

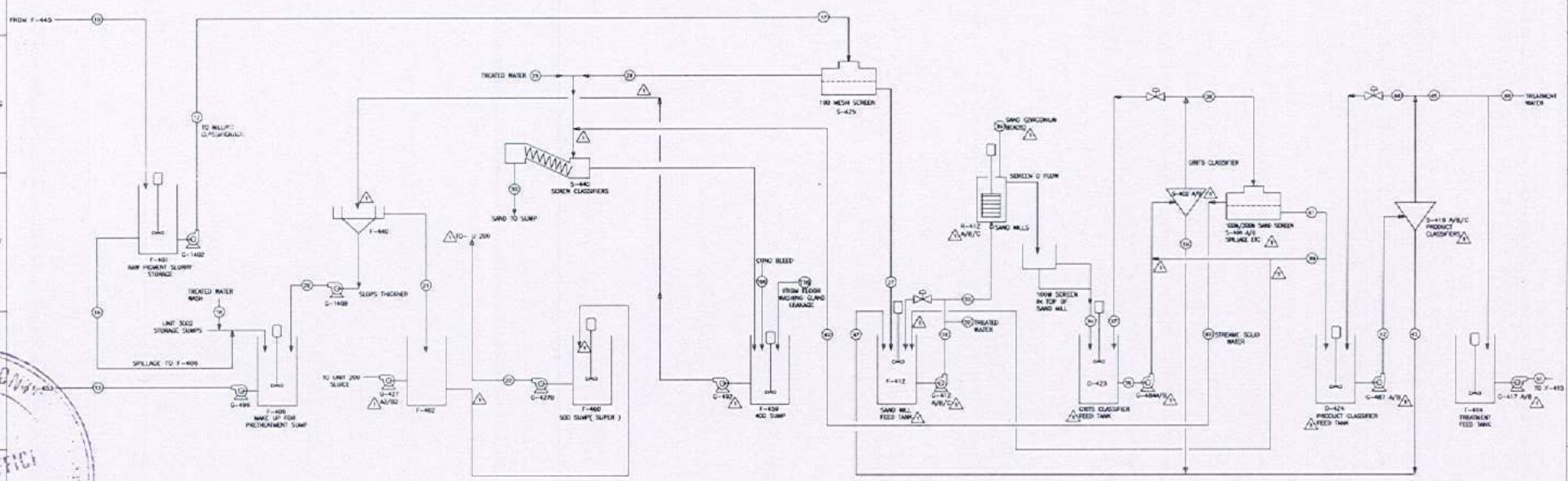
TITLE: OXIDATION SECTION U-500 PROCESS MATERIALS AND BALANACE

SHEET 2 OF 2 — DRG. No. 8139-11-PF-004 — REV. 2

A1

KERALA STATE POLLUTION CONTROL BOARD
REGIONAL OFFICE
THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer



STREAM	TO STORAGE	FRF 406	SPILL AGE	FR STOR	WASH	GRIDS UNDER	SLOPS UNDER	SLOPS O FLO	TO SLOPS THKNR	-100M	+100M	TRT W	400 SAND	F412 OUT	TRT W	L EY CONT	SAND MILLS
	10	13	16	17	18	19	20	21	22	27	28	29	30	31	32	33	34
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
ITEM																	
WATER	10289.78	9982.49	233.58	10055.93	5299.50	1664.59	6979.86	5313.88	12290.74	10103.23	17.68	4633.01	17.68	16384.71	1652.99	332.79	17664.83
TiO_2	5797.09	1214.11	150.92	5656.17		786.50	267.65	0.62	288.27	5624.88	11.58		0.90	8818.10		137.82	9479.73
SAND(SiO_2)	104.21	12.88	2.39	101.84		4.47	3.77	0.02	3.78	5.69	96.15		96.15	8.69		0.16	12.34
Al2O3	17.38	6.37	0.39	16.97		2.46	4.10	0.02	4.17	16.97	0.00			25.93		0.47	25.46
NaOH																	
SALTS	94.19	10.45	1.45	82.74		8.95	0.05	0.03	0.08	62.74	0.00			96.70		1.79	94.96
SUB + SALT																	
TOTAL	16242.36	10964.28	388.71	15873.64	5299.50	2467.00	7252.47	5314.57	12567.04	15813.82	125.22	4633.01	114.83	25315.19		480.42	29257.13

STREAM	SAND	GRIDS TOT	L EY CONT	GRITS FRW	TRT W	SPILLAGE ETC	-325M	PROD CLAS TOT	PRO CLAS TOT	L EY CONT	TO SLOPS THKNR	TO SLOPS THKNR	SAND MILL FEED TANK	TO SLOPS THKNR
	35	36	37	38	39	40	41	42	43	44	45	46	47	51
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
ITEM														
WATER		17997.48	332.69	16988.21	3399.57	2415.87	15884.24	16316.78	5985.88	334.54	9992.35	0.00	7558.47	9986.35
TiO_2		8898.29	156.50	7675.14		118.56	7554.56	2712.79	2826.75	156.18	4724.93		3621.39	4724.60
SAND(SiO_2)	3.82	12.31	0.16	7.88		0.11	7.36	2.73	2.84	0.16	4.33		1.31	4.73
Al2O3		25.93	0.47	23.00		0.41	22.86	23.13	8.49	0.47	14.70		10.95	14.16
NaOH														
SALTS			1.79	85.63		0.98	85.83	87.73	33.86	1.78	53.71		42.81	53.71
SUB + SALT														
TOTAL	3.82	26604.80	[illegible]	23790.90	3399.57	2535.14	23554.87	24155.15	8873.82	493.15	14787.78	0.00	11340.88	14787.78

8139-11-PF-005 1 OF 3 R1

A1

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CLIENTS M/s KMML-CHAVARA

REFERENCE DRAWING | REVISION

1	AS MARKED	MAHESH	KSR	CVR	04-12-14

SCALE NTS
DATE 10-01-14
DRAWN MAHESH
CHECKED JJ
DESIGNED JJ
CHECKED KSR
APPROVED CVR

FACT ENGINEERING & DESIGN ORGANISATION
THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL KERALA
FEDO

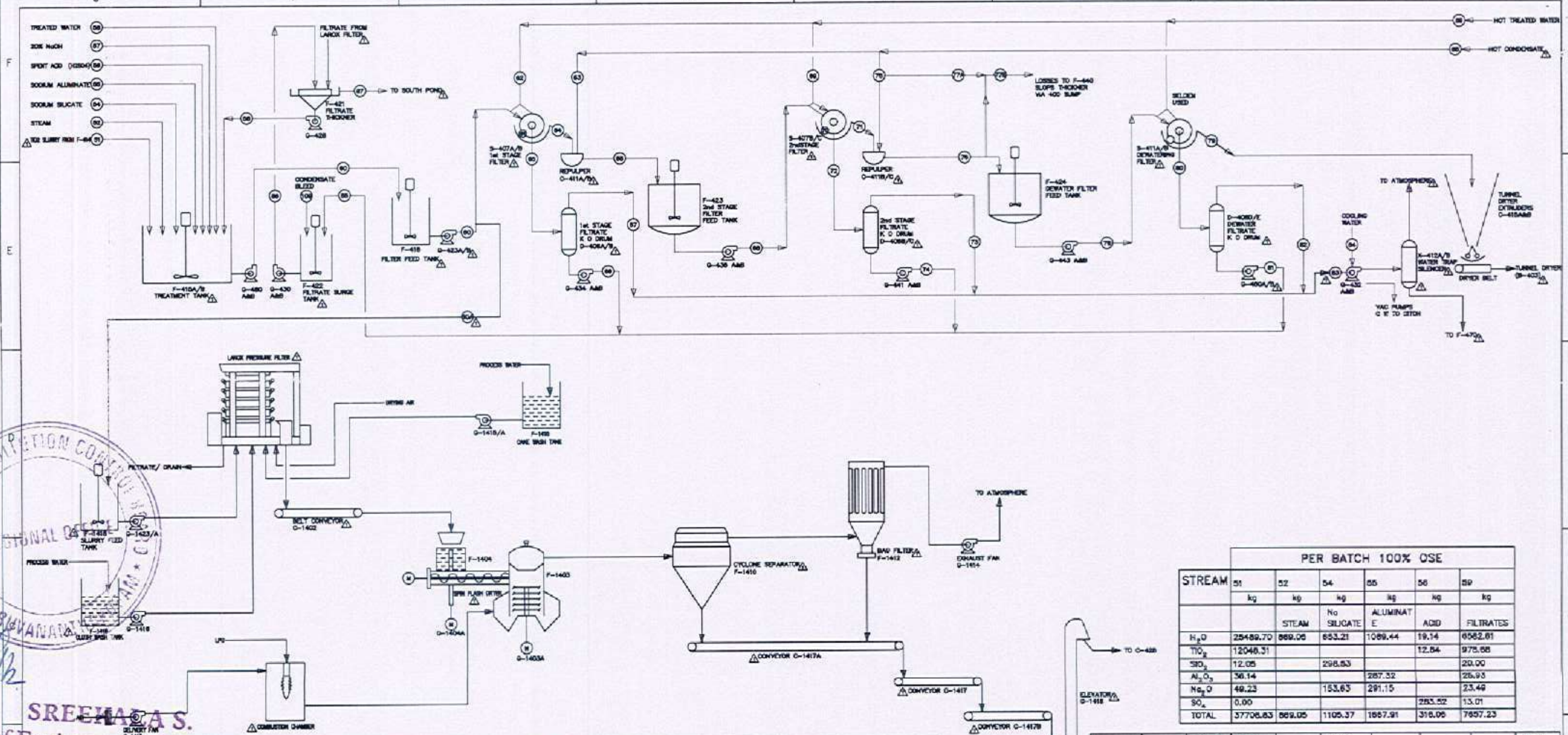
PROJECT NAME STUDY OF TITANIUM DIOXIDE PIGMENT PLANT PROJECT No: 8139

TITLE UNIT-400 PROCESS MATERIAL HEAT BALANCE

SHEET 1 OF 3 DRG. No. 8139-11-PF-005 REV. 1

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer



PER BATCH 100% OSE						
STREAM	51	52	54	55	56	59
	kg	kg	kg	kg	kg	kg
		STEAM	Na SILICATE	ALUMINATE	ACID	FILTRATES
H_2O	25489.70	869.05	653.21	1069.44	19.14	6562.61
TiO_2	12046.31				12.84	975.66
SiO_2	12.05		298.63			20.00
Al_2O_3	36.14			287.32		26.93
Na_2O	49.23		153.63	291.15		23.49
SO_4	0.00				283.52	13.01
TOTAL	37706.83	869.05	1105.37	1667.91	316.06	7657.23

	FILTER CAKE	FILTRATES	FILTRATES	REPULP	TO F 424	WASH W	TO SLOPS	TO DE WATER	FILTER CAKE	DE WATER	FILTRATES	FILTRATES	TO F 421	F 421 OFLO	REPULP	FILTWASH
STREAM	71	72	74	75	76	77A	77B	78	79	80	81	85	86	87	88	89
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
AIR																
H_2O	2433.53	8280.26	8280.26	1445.43	3878.96	1480.57	1590.66	3768.88	2382.83	1480.57	1386.05	17678.56	58882.56	56301.15	3739.83	11522.67
TiO_2									1853.34				390.50	6.70	55.24	
SiO_2									47.15				9.93	0.16	1.41	
Al_2O_3									49.11				10.35	0.15	1.46	
Na_2O														200.85		
SOLIDS									1949.59						58.11	
SO_4	1991.07	41.61	41.61	22.46	2013.53		56.97	1956.56		6.97	6.97	90.35	447.21	111.18		
TOTAL	4424.6	8321.87	8321.87	1467.89	5892.49	1480.57	1647.63	5725.44	6282.02	1487.54	1393.02	18068.91	59740.54	56620.22	3856.05	11522.67

	FEED	TO LAROX	FLTR WASH	REPULP	FLTR CAKE	FILTRATES	FILTRATES	TOF 423	FLTR WASH
STREAM	60	60A	62	63	64	65	66	68	69
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h
AIR									
H_2O	13890.57	8681.61	5761.34	2294.4	2658.06	8312.25	8312.25	4952.45	5761.34
TiO_2	5168.22	3230.14							
SiO_2	131.56	82.23							
Al_2O_3	137.02	85.64							
Na_2O									
SOLIDS									
SO_4	447.21	279.51		35.65	1997.03	41.77	41.77	2032.68	
TOTAL	19774.57	12359.106	5761.34	2330.05	4655.06	8354.02	8354.02	6985.13	5761.34

A3

<8139-11-PF-005 2 OF 3 R1>

CLIENTS M/s KMML-CHAVARA

DRAWING No: REFERANCE	No	ZONE	PARTICULARS	REVISED	CHECKED	APPROVED	DATE
	1		AS MARKED	MAHESH	KSR	CVR	04-12-14

REVISION

SCALE	NTS
DATE	10-01-14
DRAWN	MAHESH
CHECKED	JJ
DESIGNED	JJ
CHECKED	KSR
APPROVED	CVR

FACT ENGINEERING & DESIGN ORGANISATION
THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL KERALA

FEDO

PROJECT NAME STUDY OF TITANIUM DIOXIDE PIGMENT PLANT PROJECT No: 8139

TITLE UNIT-400 PROCESS MATERIAL BALANCE

SHEET NO 2 OF 3 | DRG. No. 8139-11-PF-005 | REV. 1

0OFT006/2010

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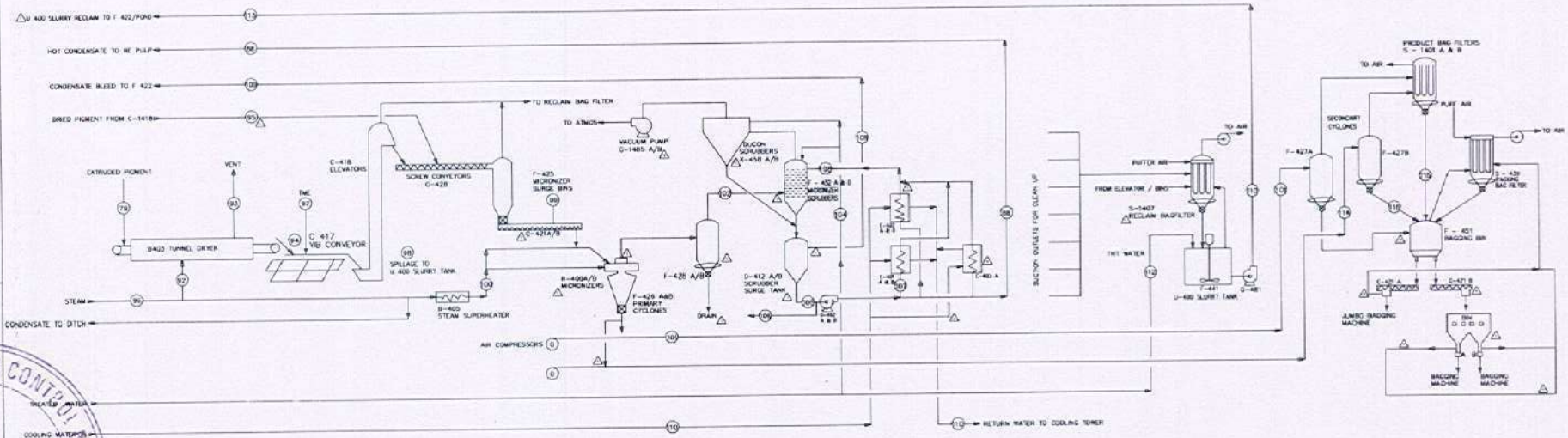
SREEKALA S.
Chief Environmental Engineer

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM



	CAKE TO DRYER	REPULP	SAT STEAM	VENT	DRY PIG	DRY PIG		LOSSES	MIC FEED	SUPHT STM	MIC PG AIR		STM TO SCR	TRTW		HTXC	COLD COND	BLEED	RECLAIM	TRTW	RECLAIM	SEC CYC	IN BAGS	
STREAM	79	88	92△	93	94△	95△	96	98	99	100	101		102	104	105	107	108	109	111	112	113	114	117	
	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	NM3	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	%	kg/h
AIR											3097.00	4005.89												
STEAM			5000.64				28122.39			14787.36			15018.40	5894.08	317284.44	2984211.54	296371.80	10939.75	4.92	257.34	257.34		1.22	36.12
WATER	6354.21	9972.89			102.64	171.07		4.92	268.79			4544.52	308.75		4686.43	4539.13	4377.67	161.45	88.95		88.95		153.79	4544.52
TiO_2	4942.23	147.30			1853.34	3088.89		88.95	4853.28			115.60	7.86		119.25	115.50	111.39	4.11	2.27		2.27		3.91	115.60
SiO_2	126.72	3.75			47.15	78.57		2.27	123.46			120.41	8.18		124.21	120.31	116.02	4.29	2.36		2.36		4.08	120.41
Al_2O_3	130.99	3.88			49.11	81.84		2.36	128.59															
TME																								
TOTAL SOLID		154.95										4780.53			4929.89	4774.94	4605.09	169.85	93.58		93.58	4780.53		4780.53
TOTAL	11553.11	10282.79	5000.64		2052.23	3420.38	28122.39	98.5009	5374.11	14787.36		13566.9	15343.2	5894.08	322214.33	2968986.48	300976.89	11109.59	98.50	257.34	350.92			4816.65

CLIENTS M/s KMML-CHAVARA

DRAWING No:	No	ZONE	PARTICULARS	MAHESH	KSR	CVR	04-12-14
REFERANCE			REVISION	REVISED	CHECKED	APPROVED	DATE
	1		AS MARKED				

SCALE	NTS
DATE	10-01-14
DRAWN	MAHESH
CHECKED	JJ
DESIGNED	JJ
CHECKED	KSR
APPROVED	CVR

FACT ENGINEERING & DESIGN ORGANISATION
THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL KERALA

FEDO

PROJECT NAME STUDY OF TITANIUM DIOXIDE PIGMENT PLANT PROJECT No: 8139

TITLE UNIT-400 PROCESS MATERIAL HEAT BALANCE

SHEET NO 3 OF 3 | DRG. No. 8139-11-PF-005 | REV. 1

8139-11-PF-005 3 OF 3

00FT006/2010

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Annexure 5

Minutes of the Joint Committee meeting (V. C.) held on 01/12/2022 in the chamber of Chief Environmental Engineer, Regional Office, Thiruvananthapuram

The Hon'ble NGT vide order in OA 502/2022 dated 29/08/2022 constituted a Joint Committee to verify the factual position with respect to Kerala Minerals and Metals Ltd (M/s KMML)., Chavara, Kollam. Accordingly a joint committee meeting on 11/10/2022 and site visit on 17/10/2022 were conducted and samples were collected from M/s KMML and its premises.

A Joint Committee meeting was convened on 01/12/2022 through VC to discuss the analysis results of the samples collected on 17.10.2022 in and around the premises of M/s. KMML, under the Chairmanship of Principal Secretary, Industries & NORKA Department, Government of Kerala. Mrs. Sreekala, The Chief Environmental Engineer, Kerala SPCB welcomed all the members and the officials to the meeting. The following members of the Joint Committee and the officers attended the meeting.

1. Sri. Suman Billa.,
   Principal Secretary, - Member
   Industries & NORKA Department.

2. Sri. J. Chandra Babu.,
   The Regional Director,
   Regional Directorate, - Member
   Central Pollution Control Board,
   Bengaluru, Karnataka- 560079.

3. Sri. Mukund Thakur I.A.S.,
   Sub Collector, Kollam. - (on behalf of District Collector)

4. Dr. John C. Mathew
   Environment Programme Manager
   Directorate of Environment and Climate Change
   Thampanoor, Thiruvananthapuram - Member
   (Representative of SWAK)

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM

1

SREEKALA S.
Chief Environmental Engineer

5. Mrs. S. Sreekala, - Nodal Officer
   Chief Environmental Engineer,
   Kerala State Pollution Control Board
   Regional Office, Thiruvananthapuram

6. Dr. Deepesh V.
   Scientist 'C'
   Central Pollution Control Board
   Regional Directorate (South), Bengaluru.

7. Smt. Rachel Thomas
   Environmental Engineer,
   District Office, Kollam

8. Smt. Sreetha A. M.,
   Assistant Environmental Engineer,
   Regional Office, Thiruvananthapuram.

9. Smt. Asha J.S.,
   Assistant Engineer,
   Regional Office, Thiruvananthapuram.

The Chief Environmental Engineer detailed about the analysis report of the samples collected. All the **stagnant water samples** collected from the nearby premises of the industry, the canal near MS plant, TS canal and near Vattakkayal had acidic pH in the range of 2-3. The parameters such as Iron and Manganese were exceeding the limits in all these locations. Zinc exceeded in two locations and Vanadium exceeded in some of the locations. The parameters such as Oil and grease, Total residual chlorine, Copper, Cadmium, Total chromium, Nickel, Lead, Arsenic and Titanium for all the samples collected outside the industry were Below Detectable Limit (BDL). The samples from the **ETP pond (supernatant) and approved discharge point of KMML** shows neutral pH whereas the parameters such as Total Suspended Solids, Total Chromium, Iron, Manganese, Vanadium, and Titanium were exceeding the limits prescribed under the Consent issued under the Water (Prevention and Control of Pollution) Act, 1974. One of the **well water sample** shows an acidic pH of 3.1 and the

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM

2SREEKALA S.
Chief Environmental Engineer

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parameters such as Iron and Manganese are exceeding the limits prescribed for Drinking Water Specifications i.e., IS 10500:2012. The other two well water samples shows neutral pH and the value of Iron exceeding the limits prescribed for Drinking Water Specifications i.e., IS 10500:2012 and suspended solids were also present. The parameters such as Iron, Manganese, and Vanadium were present in the iron oxide sludge sample. All these parameters were exceeding the limits (as per MoEF guidelines) in the stagnant samples collected from the nearby premises. It may be inferred that there is every possibility of leakage or runoff from iron oxide sludge from the company to the nearby premises. The analysis of the stagnant water samples collected from the nearby area of the company show acidic pH and presence of heavy metals. All the three well water samples also show high concentration of iron and one sample shows acidic pH. It is understood that the nearby area is polluted and the wells are not fit for drinking purpose. The storm water sample (KLMK11) of the industry show acidic pH and presence of Iron, Manganese and Vanadium which implies that the land inside the industry is either polluted or there is a possibility of leakage / spillage of iron oxide sludge into nearby area including Vattakayal. The treated effluent sample from the industry shows total suspended solids and heavy metals above the limit specified which implies that the present treatment system is not adequate enough to comply with the effluent discharge standards and requires upgradation. The graphical representation of the analysis results were also presented during the meeting. Chief Environmental Engineer pointed out that the parameters of stagnant water is compared with MoEF guidelines with respect to surface water and the parameters of well water is compared with the drinking water specifications (I S 10500:2012)

Sri. J Chandra Babu, Regional Director CPCB Bengaluru was of the view that the analysis results of the collected effluent discharge sample reveal that the effluent discharge sample is exceeding limits permissible under the consent

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer

norms, and also existing effluent treatment system consisting of neutralization using lime followed by settling tank, which is not adequate for removal of heavy metals and also to comply with the effluent discharge norms. Therefore, he opined that existing effluent treatment system should be upgraded to ensure compliance to the consent discharge norms. Regional Director also added that there is every chance of runoff from the existing iron oxide pond area specially during monsoon resulting pollution of nearby land. In order to avoid this, scientific approach should be followed in line with the guidelines issued by CPCB from time to time. Regional Director also pointed out that proper sign boards should be placed at all the suitable places to avoid human/ animal contact with the polluted stagnant water bodies in the vicinity of the human habitation.

Members of the Joint Committee were of the view that actual problems associated with M/s. KMML need to be identified, both short term and long term remedial measures to be suggested to comply the same in a time bound manner by M/s KMML. Therefore, Committee members suggested for seeking extension of time for filing the final report through the KSPCB advocate.

The Regional director and Principal Secretary, Government of Kerala pointed out that the basic findings of the committee regarding the matter shall be shared with the company authorities and a meeting shall be scheduled to discuss the status and to further proceed in the matter. Kerala SPCB being nodal agency in the matter, necessary information to be collected from M/s. KMML authorities and draft Joint Committee report need to be prepared and circulated to the committee members at an early date seeking comments or views for its finalization and for filing before Hon'ble NGT for consideration.

The meeting ended with vote of thanks to the Chair.

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM

CHIEF ENVIRONMENTAL ENGINEER

SREEKALA S.
Chief Environmental Engineer

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Minutes of the Joint Committee meeting held on 09/12/2022 at Kerala Minerals and Metals Ltd. (M/s KMML), Chavara, Kollam

The Joint Committee meeting was convened on 09/12/2022 at Kerala Minerals and Metals Ltd (M/s KMML)., Chavara, Kollam premises to ensure compliance to the Hon'ble NGT order dated 29/08/2022 passed in OA No. 502/2022. At the outset, Mrs. Sreekala, The Chief Environmental Engineer, Kerala SPCB, Nodal Officer welcomed all the members of the Joint Committee and the officials attended the meeting. The following Joint Committee members and officers attended the meeting.

Joint Committee Members:-

1. Sri. Suman Billa.,
   Principal Secretary, - Member (via V.C.)
   Industries & NORKA Department.

2. Sri. J. Chandra Babu.,
   The Regional Director,
   Regional Directorate, - Member
   Central Pollution Control Board,

3. Sri. Roy Kumar F.
   Deputy Collector LA, -- (on behalf of District Collector)
   Collectorate, Kollam

4. Dr. John C. Mathew
   Environment Programme Manager
   Directorate of Environment and Climate Change
   Thampanoor, Thiruvananthapuram - Member
   (Representative of SWAK)

5. Mrs. S. Sreekala, - Nodal Officer
   Chief Environmental Engineer,
   Kerala State Pollution Control Board
   Regional Office, Thiruvananthapuram

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM

1 SREEKALA S.
Chief Environmental Engineer

Officials attended the meeting: -

6. Smt. Rachel Thomas
   Environmental Engineer, KSPCB
   District Office, Kollam

7. Smt. Sreetha A. M.,
   Assistant Environmental Engineer,
   Regional Office, KSPCB, Thiruvananthapuram.

8. Smt. Asha J.S.,
   Assistant Engineer,
   Regional Office, KSPCB, Thiruvananthapuram.

Representatives of M/s KMML

1. Sri. Chandra Bose
   Managing Director
   Kerala Minerals and Metals Limited

2. Sri. Manikkuttan P.K.
   HOU (TP/TSP)
   Kerala Minerals and Metals Limited

3. Sri. Anilkumar K. S.
   HOD (Environment)
   Kerala Minerals and Metals Limited

4. Sri. Sahil M.
   HOD (Projects)
   Kerala Minerals and Metals Limited

5. Sri. Ajesh Chandran B.C.
   Manager (Civil)
   Kerala Minerals and Metals Limited

With the concurrence of committee, Sri. Chandra Bose, Managing Director, M/s.KMML made a presentation on the status of short term and long term remedial measures as detailed below:-

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- One of the short term remedial measure is construction of garland drain around the existing old dumpsite of Iron Oxide Sludge and is reported to be completed 75% around the new ETP and same expected to be completed by January 2023 and whereas around old ETP, about 40% of work completed and expected to be completed fully before by March 2023.
- Regarding the remediation of affected land around the company premises, test patches were carried out and expected to be completed by March 2023.
- As part of waste management, Geotube technology is proposed and is waiting to get approval from State Government as well as Central Pollution Control Board.
- Proposed modification of Acid Recovery plant as long term measure is pending for approval from Government of Kerala. After the modification of this plant, the iron oxide expected to be generated free from acid content and in saleable form. Another suggestion by NEERI was the value addition of the iron oxide sludge to saleable products.
- Managing Director also added that, one German company, M/s Tetrabic, approached to construct a plant inside the M/s.KMML for converting the ETP sludge and iron oxide sludge into usable products and this project is pending for State Government Approval.
- The ETP sludge (50000 Tonnes) is being transferred to M/s. Miracle Sands and Chemicals in Tamilnadu for processing and further utilization with the approval of the Kerala State Pollution Control Board (KSPCB). As on date, about 10000 Tonnes of ETP sludge already transferred to M/s. Miracle Sands and Chemicals in Tamilnadu.
- The Managing Director also apprised the committee that the internal R & D team has developed a new technology of converting acidic iron oxide sludge into neutral metallic iron and the samples are sent to some steel

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industries and waiting for their response for utilizing as raw material. The R & D wing has also came up with additional techniques which are under trial run. The production of DRI pellets from the iron oxide was also found successful within the company.

- About 2 to 3% of their profit is presently spending towards the company's corporate social commitment. The social commitment activities by the company include welfare activities in 7 wards including the drinking water supply, sanitation and also conducting of regular medical camps etc.

The Principal Secretary enquired whether these remedial measures are adequate for mitigating the defects noticed by the committee as part of the study. The Managing Director agreed that the water samples outside the company premises are found to be acidic in nature which is mainly due to the runoff from the existing iron oxide old dump site. As a short term measure, trial for remediation of affected land is under progress and same will be implemented to remediate the land outside the company premises, upon successful results. However, he expressed that permanent solution for this issue is acquisition of 76 acres of affected land around the company. Earlier 183 acres were identified and out of that, 76 acres were most affected area and the company have active plan to acquire that land.

To the query of The Principal Secretary regarding the adequacy of the proposed remedial measures suggested by the company to mitigate the pollution issues, Mr. Manikuttan, representative of KMML replied that even though the long term and short term measures were suggested, the acquisition of affected land is the final solution for this problem. Test patch study itself cost huge amount and about 2-3 km near the company needs to be remediated and it will become a huge burden for the company. He added that once the R & D study of the

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company becomes successful the entire iron oxide sludge can be converted into value added products. The capping of the existing ponds can also be done to avoid overflow.

The Chief Environmental Engineer mentioned that there is no fruitful remedial measures put forwarded by the company to remediate the affected land near the industry. The patch test for the remediation of land and replication of it into the surrounding area will take long time.

The Regional Director, CPCB stated that some of the remedial measures by the company is as per recommendations of the expert institute of repute. The feasibility of the measures suggested by the company has to be examined in detail. Among the process change, one of the suggestions is that a wash water provision as option for recovery of acid (which should be recycled in the process) and the iron oxide sludge to be neutralized using suitable chemicals before disposal of iron oxide sludge into storage tank. The Regional Director also added that the runoff through proposed garland drain construction around the existing iron oxide pond need to be connected to the suitable treatment system to avoid acid bearing surface runoff into the nearby low lying areas or human habitation. He is of the view that better solution is that the entire existing iron oxide dump yard should be covered with suitable liners temporarily till zero waste policy is adopted. If no solution is found by the industry, entire iron oxide sludge yards to be capped permanently in line with the guidelines issued by CPCB. The Ground water monitoring has to be carried out in and all around the areas to check the contamination and for taking remedial measures if required. Also, signboards boards at all the salient points shall be placed where the contaminated stagnant water is present. Lime treatment in the existing dump yards as temporary measures shall be continued. The remediation of surrounding area is not so easy task and industry should come out with the

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alternate options for utilization of generated process sludge. The regular water supply and periodical health camps should be ensured by the company to the affected people. The R & D options to be implemented at an early date by taking requisite approvals from KSPCB and CPCB following the manifest as required under the Hazardous and Other Waste Transboundary Movement Rules, 2016 as amended, for which suitable conditions to be imposed and amended under the approvals granted to the industry by KSPCB. The company has to submit a time bound action plan covering all the feasible options for resolving all the associated problems. Regional Director also added that the tube well samples are being collected and analyzed and will come out with further suggestions, if required.

The committee also heard the applicant over telephone. The applicant Mr. Padmakumar informed that the acquisition of land near the temple area is not included due to political issues. He added that the committee also not visited the area on the southern side of the temple which is highly affected. There is no aim to close down the company. But the company is not at all complying with the directions of NGT. During the flood in 2018, red coloured water entered the nearby residents and polluted drinking water. Most of the affected areas are not considered even for land acquisition. In response, The Principal Secretary mentioned that the committee had made some additional recommendations to the company and the company will submit the action plan and it will be communicated to the complainant.

The Principal Secretary concluded that the company has to come up with detailed action plan as per the recommendations made by the committee and time bound action plan to be submitted to the Nodal Officer within a week to enable to take action for preparation of draft report of the Joint Committee by KSPCB.

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The Chief Environmental Engineer informed that the matter is listed for hearing on 13.12.2022 and additional time for filing final report of the Joint Committee before the Hon'ble NGT, would be sought through KSPCB legal Counsel.

The meeting ended with Vote of Thanks to all.

CHIEF ENVIRONMENTAL ENGINEER

KERALA STATE POLLUTION CONTROL BOARD
REGIONAL OFFICE
THIRUVANANTHAPURAM

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Chief Environmental Engineer

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEWDELHI

IN

ORIGINAL APPLICATION NO. 502 of 2022

Petitioner : Padmakumar

Versus

Respondent(s) : The State of Kerala

REPORT OF THE KERALA STATE POLLUTION CONTROL BOARD FILED BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEW DELHI IN THE MATTER OF O.A. NO. 502/2022.

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEWDELHI

IN

ORIGINAL APPLICATION NO. 502 of 2022

Petitioner : Padmakumar

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Dated this the 07th day of February 2023

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BEFORE THE HONOURABLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH

Original Application no. 502/2022

State of Kerala : Respondent(s)

VERIFICATION

I, Sreekala S. , Chief Environmental Engineer, Kerala State Pollution Control Board, Regional Office, Thiruvananthapuram, do hereby verify on this the 7th day of February 2023, that all what is stated above are true and correct to the best of my knowledge, information and belief.

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Sreekala S.

Chief Environmental Engineer

KSPCB

SREEKALA S.
Chief Environmental Engineer

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEWDELHI

IN

ORIGINAL APPLICATION NO. 502 of 2022

Petitioner : Padmakumar

Versus

Respondent(s) : The State of Kerala

REPORT FILED BY THE CHIEF ENVIRONMENTAL ENGINEER, KERALA STATE POLLUTION CONTROL BOARD, REGIONAL OFFICE, THIRUVANANTHAPURAM BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEWDELHI IN THE MATTER OF O.A. NO. 502/2022.

Report filed by Smt. Sreekala S., Aged 52 years, W/o Sri. A. Viswambharan, Chief Environmental Engineer, Kerala State Pollution Control Board, Regional Office, Thiruvananthapuram.

I, the Chief Environmental Engineer, Kerala State Pollution Control Board, (hereinafter referred to as **Board**), Regional Office, Thiruvananthapuram is authorized to represent the Board (3 rd respondent) in the above O.A. Copy of the authorization is produced as **Annexure 1**. This Report is filed on behalf of the Kerala State Pollution Control Board, as directed by this Hon'ble NGT in its Order dated 13-12-2022.

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In the above O.A., the petitioner alleges that the KMML is polluting the land and water bodies for about 30 years by discharging acid water and the area surrounding the factory has become unfit for any purpose and the villagers were forced to close the drinking water wells which were filled with acid. The petitioner further alleges that the industry is pumping acid waste directly to sea and connected lake through canals and also the Vattakkayal in Porookkara is filled with the acid clay waste polluting the environment and endangering life of the villagers.

The Hon'ble NGT vide order dated 29/08/2022 constituted a Joint Committee comprising of Principal Secretary, Industries & NORKA, Central Pollution Control Board, State Pollution Control Board, State Wetland Authority and District Collector, Kollam and directed the joint committee to file a report after verifying the factual position. The State Pollution Control Board is the nodal agency for co-ordination and compliance.

The Joint Committee in compliance to the order, conducted meetings, site visit, sampling and heard the complainant. Interim report was filed before NGT on 29/11/2022. After considering the interim report the Hon'ble Tribunal directed to take appropriate remedial measures and also file action taken report along with the reply / response within 2 months. The Hon'ble NGT vide Order dated 13-12-2022 has directed the Board to file action taken report. This report is filed in compliance with the above order of this Hon'ble NGT.

1. About the industry and Manufacturing Process

M/s. KMML is a fully integrated rutile grade titanium dioxide plant under Government of Kerala .The TiO_2 pigment unit was commissioned in 1984 at

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Sankaramangalam, Chavara, Kollam, Kerala with a titanium dioxide manufacturing capacity of 1459.125 TPA. Presently, the industry is involved in manufacture of titanium dioxide at 100 TPD (average).

M/s. KMML produces titanium dioxide from ilmenite mineral ore through the chloride process. The units in the titanium pigment factory include Ilmenite Beneficiation Plant, Chlorination Plant, Oxidation Plant and Pigment Finishing Unit. In the ilmenite beneficiation plant the raw Ilmenite containing 58 -60% of Titanium Dioxide is beneficiated to 90% Titanium Dioxide content. In the acid regeneration plant the spent leach liquor from digester is processed in a spray roaster in which the liquid spray entering the furnace is atomized at high temperature (650 to 850 ^{O}C) in presence of air. In the chlorination plant beneficiated Ilmenite from Ilmenite Beneficiation Plant is chlorinated to produce Titanium Tetra Chloride. In the oxidation plant, the Titanium Tetra Chloride is vaporized, preheated and oxidized with oxygen to produce raw Titanium Dioxide pigment at high temperature (1050^{O}C). The by-product chlorine is recycled to the chlorination plant. Raw titanium dioxide is slurried and pumped to the pigment finishing unit. In the pigment finishing unit the treated slurry is washed and filtered. The filter cake is then subjected to drying to drive off the moisture followed by micronization. The micronized final pigment is bagged using an automatic bagging machine.

At present, for production of TiO_2 pigment, raw materials consumption is as follows:- Ilmenite mineral ore (1.65 MT of raw ilmenite/ MT of Beneficiated Ilmenite (BI) -120 TPD of BI), Chlorine (0.115 MT of makeup chlorine/MT of $TiCl_4$ – 270 TPD of $TiCl_4$), Hydrochloric acid (0.85 MT of makeup acid/ MT of Beneficiated ilmenite- 120 TPD of BI).

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2. Status of Integrated Consent to Operate issued to M/s. KMML

The unit is having an integrated consent to operate including authorisation renewed on 13/09/2021 with validity up to 31/07/2025 for the production of 120 TPD of TiO_2. As per integrated Consent issued to M/s.KMML, the industrial unit is categorised as Red Category, total water consumption is 11,728 m^3/day from 14 tube wells located within the industry premises and the maximum quantity of treated effluent discharged into the sea shall not exceed 4800m^3/day. Also, as per consent conditions, the unit shall install pH online measurement facility at the outlet and water meters shall be fixed to record consumption of water. Also, the process sludge i.e.,50 TPD iron oxide sludge (21.1 Category) shall be stored in secured lined ponds and thereafter dewatered and disposed in Common Treatment Storage and Disposal Facility (CTSDF) at Kochi. CAAQMS (Continuous Ambient Air Quality Monitoring Station) and OCEEMS (Online Continuous Effluent and Emission Monitoring System) shall be installed and record maintained. The discharge norms of treated effluent prescribed under the Integrated Consent to Operate issued to M/s. KMML is given in the **Table 1 below**.

Table 1. Tolerance Limit of Treated Effluent Prescribed to M/s. KMML

Sl. No.	Characteristics	Unit	Tolerance Limit
1	pH	mg/l (Max)	5.50 to 9.0
2	Suspended Solids	mg/l (Max)	100
3	Oil & Grease	mg/l (Max)	20
4	Total Residual Chlorine (as Cl)	mg/l (Max)	1.0
5	Total Chromium(as Cr)	mg/l (Max)	2.0
6	Zinc (as Zn)	mg/l (Max)	15.0

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Sl. No.	Characteristics	Unit	Tolerance Limit
7	Titanium (as Ti)	mg/l (Max)	5.0
8	Lead (as Pb)	mg/l (Max)	2.0
9	Vanadium (as V)	mg/l (Max)	0.2
10	Manganese (as Mn)	mg/l (Max)	2.0
11	Iron (as Fe)	mg/l (Max)	3.0
12	Total Heavy Metals	mg/l (Max)	7.0

3. Water Consumption and Wastewater Effluent Treatment

As per the information provided by M/s KMML, there are 14 ground water tube wells within the industry premises .Presently, the water consumption is reported to be about 6912 m^3/day. Waste water generation is 3642 m^3/day (Maximum) and a maximum of 1200 m^3/day of treated effluent from the existing ETP is discharged through the approved outlet into the sea from the ETP settling pond. The detail of water consumption is submitted as **Annexure 2.** The flow diagram of ETP operated by M/s. KMML is shown in **Figure. 1**.

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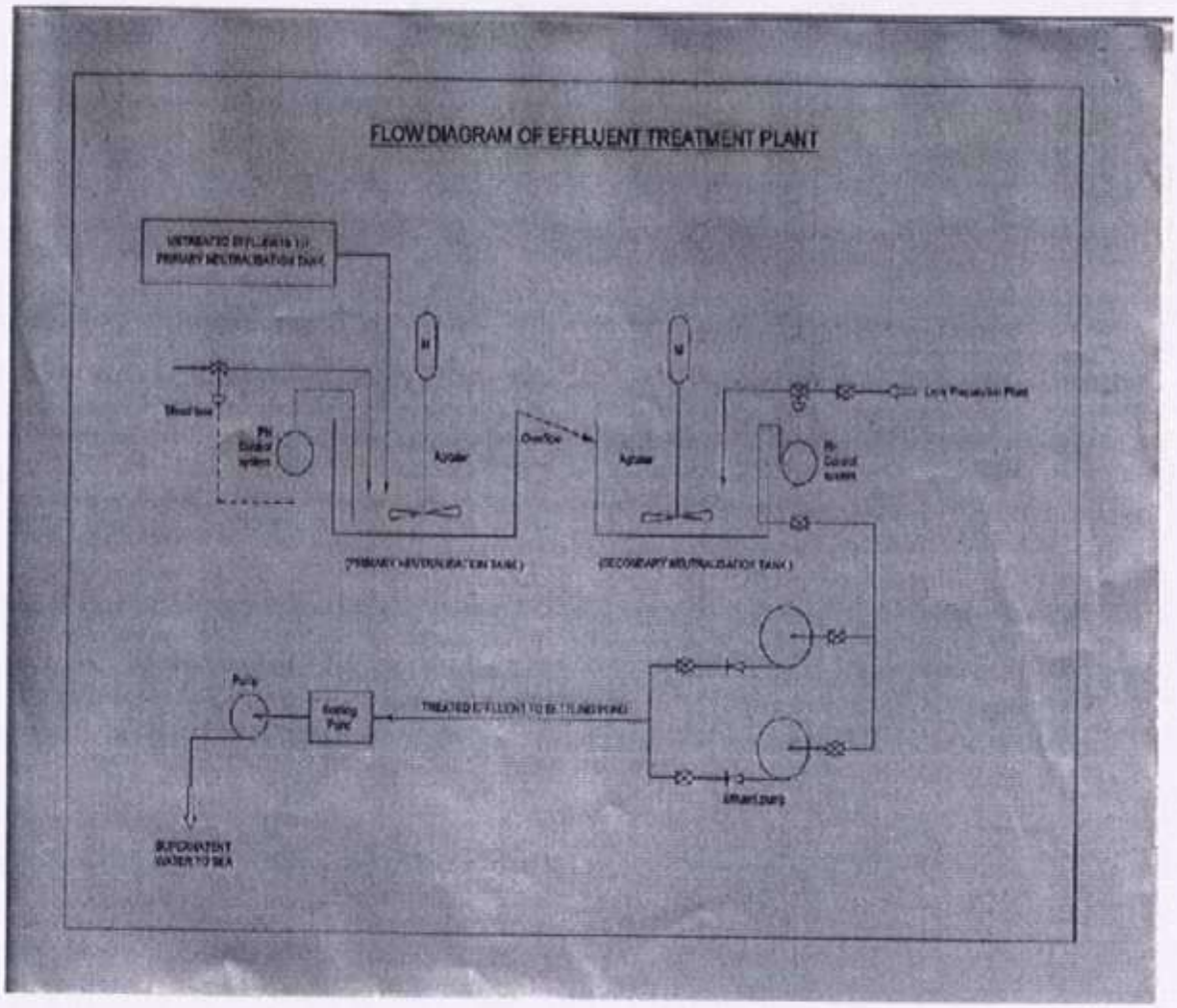

Figure 1. Flow Diagram of Effluent Treatment Plant operated by M/s. KMML

As per the information provided by M/s.KMML, at present the wastewater effluent is generated at about 3642 m^3/day, as a part of the TiO_2 manufacturing process. Effluent from all the process units (i.e., mainly ilmenite beneficiation plant, acid regeneration plant, and pigment production plant) are pumped to the primary neutralization tank (PNT) and neutralized with the lime scrubber provided. pH is monitored in the PNT and is maintained around 4-5 by the addition of lime solution and the retention time is about 60 minutes. The liquid in the primary

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neutralization tank overflows into the secondary neutralization tank. In addition to the overflow from the primary neutralization tank, the effluents from various units of the pigment production plant (pH less than 4.5) are fed into the secondary neutralization tank. Overflow from primary neutralization tank, bleed lime from scrubber, effluent from area sump, effluent from solid waste tank and lime from lime preparation plant are the effluents neutralized in secondary neutralization tank. The retention time of the contents in the tank is around 25 minutes to 35 minutes and pH is maintained at 7-8. Neutralized effluent is pumped to holding ponds. The treated effluent in the pond is periodically pumped to sea. It was reported by the industry that the quantity of lime added is about 40-50 MT/day. *However, neither online pH meter nor OCEEMS including flow meter are installed in the outlet before discharging the treated effluent in to the sea, for real time assessment of compliance to effluent discharge norms and total effluent discharged in to sea.*

4. ETP Waste and Iron Oxide Waste Management Scenario

M/s. KMML used to generate iron oxide sludge from acid regeneration plant at about 1451 TPA in the year 1985 and ETP sludge from the Effluent Treatment Plant, at around 729 TPA in the year 1984. The generated wastes were stored within the industry premises in two number of old iron oxide ponds (claimed to have single LDPE liner with brick lining beneath) as well as two old ETP sludge ponds, which have already been filled and are not capped (as per CPCB guidelines issued in February 2001). As per M/s. KMML total quantum of iron oxide sludge stored in two old ponds was about 2,00,000 MT generated during the period 1985-2008 and ETP sludge from the Effluent Treatment Plant stored about 2,00,000 Metric Tonnes generated during the period 1984-2008, within the industry premises.

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As per the records of District Office , Kollam, during the late 80's and early 90's due to failure of the liner of the iron oxide pond of the industry, acid from iron oxide sludge pond had leaked into soil causing pollution of the soil and groundwater of the nearby area. Following this, a number of cases were filed against the industry before the Hon'ble Court of Kerala and the Hon'ble NGT. These underground ponds were abandoned in 2008 and a new pond (pond 3) was constructed above the ground level with a liner system.

M/s. KMML vide letter dated 08/01/2018 had requested Chairman, Kerala SPCB for permission to temporarily transfer and store the iron oxide sludge from new pond (after neutralization maintaining a pH around 5) in the old ponds after providing proper lining (with HDPE) and other precautionary measures . The Kerala SPCB had granted in principle clearance for the removal and transfer of iron oxide from pond no. 3 to pond no. 1 in strict compliance with directions issued in May 2018. Meanwhile, the company had obtained Integrated Consent to Establish (ICE) on 3/10/2018 for construction of a new iron oxide pond, but the work is not yet started. The company again requested for the temporary transfer of iron oxide from pond 3 to pond1 and pond 2. As per the meeting held on 06/11/2019, it was decided that the request cannot be permitted as pH of the slurry in the old pond was around 2 as per the report from Environmental Engineer, District Office, Kollam. During March 2020, the industry requested to issue sanction for transfer of iron oxide sludge to M/s Miracle Sand and Chemicals, Tuticorin for processing the same in their facility at Tuticorin, Tamil Nadu. But the Board denied their request on 26/06/2020 as the iron oxide sludge is not exempted from Hazardous waste category. Later as per the request from KMML, the Board had issued In- Principle Clearance vide letter dated 05/04/2021, for the removal and transfer of iron oxide from new pond to old pond, existing within the company

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premises, in strict compliance with some directions. Further the industry had requested for permission to transfer iron oxide sludge from pond no.3 to ponds 1 &2 after neutralization to avoid closing down of industry due to filling up of pond no.3.Since the third pond was reported to be almost completely filled and in the light of the upcoming monsoon season, the Board permitted transfer of sludge. However the permission was restricted to monsoon season only as per the decision in the meeting held on 16/05/2022. After receiving repeated complaints from nearby residence of Panmana, Chittur and nearby areas of M/s. KMML, the Board had inspected the unit and not permitted the transfer of iron oxide sludge from new pond to old pond. It was reported by industry that 22500 MT of iron oxide is transferred from new pond to old ponds till now. The Board Vide letter dated 23/08/2022, issued directions to transfer the iron oxide slurry to M/s. Kerala Enviro Infrastructure Limited (M/s. KEIL) for scientific disposal in accordance with the Hazardous and Other Waste (Management & Transboundary Movement) Rules 2016 as well as guidelines issued by CPCB. But the industry has reported that they have not initiated disposal of iron oxide to common TSDF as this activity was kept in abeyance from 08/08/2014 as directed by the Kerala State Government and presently awaiting reply from Principal Secretary regarding the review of transportation and disposal of iron oxide from M/s. KMML to Common Hazardous Waste Treatment and Disposal Facility (CHWTSDF) of M/s. KEIL located at Ambalamugal.

At present, as informed by M/s. KMML, TiO_2 pigment production is about 100 TPD and in the process, the iron oxide sludge from acid regeneration plant is generated (around 75 Tonnes per day (TPD) and ETP sludge from the Effluent Treatment Plant (around 50 TPD). Both iron oxide and ETP sludge are presently

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stored separately in the new ponds. At present, the capacity of the iron oxide and ETP sludge ponds are almost exhausted.

It was reported that about 1,70,454 MT of ETP sludge generated from April 2011 to March 2022. M/s. KMML had obtained permission from Kerala SPCB vide letter No. PCB/HO/KLM/ICO/08/08 dated 26/06/2020 for transfer 50,000 MT of ETP sludge to M/s. Miracle Sands & Chemicals, Tuticorin for processing and utilization. 10000 MT was already transferred during the month of June 2020, but they could not transfer the entire quantity due to Covid pandemic situation. Permission was granted by the Hon'ble Chairman vide letter No. PCB/HO/KLM/MIRACLE SANDS & CHEMICALS/2020 dated 22/08/2022 to M/s. Miracle Sands & Chemicals, Tuticorin for collection and transportation of the remaining 40000 MT of ETP sludge from M/s. KMML before 31/03/2023 without causing any environmental pollution and by taking necessary precautionary measures following the guidelines as applicable.

5. Action taken report

In compliance with the Hon'ble NGT order dated 29.08.2022 passed in O.A. No. 502/2022, Kerala State Pollution Control Board organised Joint committee meetings and made site visit to M/s KMML and it's nearby premises of M/s KMML. The joint committee members visited the affected areas and heard the complainant. The stagnant water samples and well water samples from the nearby premises of the unit, sample from the effluent discharge point of the unit to the sea and sludge samples and tube well water samples inside the industry were collected during the visits. The samples were analysed for general parameters and heavy metals. The analysis results of the samples reveal that;

- The analysis of the stagnant water samples collected from the nearby area of

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the company show acidic pH and presence of heavy metals. All the three well water samples also show high concentration of iron and one sample shows acidic pH. It is understood that the nearby area is polluted and the well water is not fit for drinking purpose. M/s KMML has reported that the unit is supplying about 7 to 8 lakhs litres /day of drinking water to the local residence in the surrounding area.

- The storm water sample (KLMK11) of the industry show acidic pH and presence of Iron, Manganese and Vanadium which implies that the land inside the industry is either polluted or there is a possibility of leakage / spillage of iron oxide sludge into nearby area including Vattakayal. The steps are being taken by Board to include the Porookkara reach of Vattakayal as a monthly water quality monitoring station.

- The treated effluent sample from the industry shows total suspended solids and heavy metals above the limit specified which implies that the present treatment system is not adequate enough to comply with the effluent discharge standards and requires upgradation. The analysis results of the collected effluent discharge sample revealed that the parameters are exceeding the limits permissible under the consent norms, and also existing effluent treatment system consisting of neutralization using lime followed by settling tank, which is not adequate for removal of heavy metals and also to comply with the effluent discharge norms. Therefore, the existing effluent treatment system should be upgraded to ensure compliance to the consent discharge norms.

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- Based on the observations made during the visit that there is every chance of runoff from the existing iron oxide pond area especially during monsoon resulting pollution of nearby land. In order to avoid this, scientific approach should be followed in line with the guidelines issued by CPCB from time to time.

- The analysis results of the 14 tube well samples reveal that the pH of the tube well water samples were within a range of 5.7-7.6 and iron content is present in all the samples in the ranges of 0.1 mg/L to 5.5 mg/L and exceeding the prescribed limits of BIS Drinking Water Specification (IS 10500:2012) except at two locations. Manganese is present in two tube well water samples, whereas Lead is present in one of the sample of ground water and exceeding the prescribed limits (Mn:0.1 mg/l and Pb :0.01 mg/l) of BIS Drinking Water Specification (IS 10500:2012).

- As per M/s. KMML, the depth of ground water in the tube well located within industry premises is around 250- 300 feet below ground level and probably this could be the reason, all the tube well water do not show much contamination.

- The parameters such as Iron, Manganese, and Vanadium were present in the iron oxide sludge sample. All these parameters were exceeding the limits (as per MoEF guidelines) in the stagnant samples collected from the nearby premises. It may be inferred that there is every possibility of leakage or runoff from iron oxide sludge from the company to the nearby premises.

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It is respectfully submitted that the analysis results also reveal that pH value of sludge from new iron Oxide pond observed as 1 which is highly acidic and falls under the hazardous waste category. As per the Hazardous & Other Waste (Management and Transboundary Movement) Rules, 2016 "*The occupiers of facilities may store the hazardous and other wastes for a period not exceeding ninety days.*"Also the company cannot extend the period of 90 days as there is a common treatment storage disposal facility (Common Hazardous Waste Treatment and Disposal Facility (CHWTSDF) of M/s. KEIL located at Ambalamugal) within the state .The shifting of entire hazardous waste to the CHWTSDF located nearby should be done in accordance with the Hazardous & Other Waste (Management and Transboundary Movement) Rules, 2016 as amended. But the company has reported that they are awaiting for approval from the Government for the same. Hence it is recommended to dispose the hazardous waste by constructing an onsite secured landfill.

It is respectfully submitted that the basic findings of the committee regarding the matter were shared with the company authorities, in compliance to the Hon'ble NGT order dated 29.08.2022.The company authorities informed that their internal R & D team has developed a new technology of converting acidic iron oxide sludge into neutral metallic iron and the samples are sent to some steel industries and waiting for their response for utilizing as raw material. The R & D wing of M/s. KMML also came up with additional techniques which are under trial run. One technique was tested within the company and found successful. As a short term measure, trial for remediation of affected land is under progress and the same will be implemented to remediate the land outside the company premises, upon successful results. The company reported that acquisition of 76 acres of affected land around the company in view of the highly acidic stagnated water in the nearby

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locality may also be considered. Earlier 183 acres were identified and out of that 76 acres were the most affected area and the company have active plan to take up that land. M/s KMML is still in the process of implementation of short term and long term measures.

It is respectfully submitted that M/s KMML submitted time bound action plan for implementation of various short term and long term remedial measures and the Joint Committee verified the same and provided specific remarks. Joint Committee filed a detailed report before the Hon'ble NGT on 31/01/2022. The upgradation of the existing effluent treatment system, placing of sign boards at all the suitable places to avoid human/ animal contact with the polluted stagnant water bodies, permanent capping of the existing storage ponds or shifting of entire hazardous waste to the CHWTSDF, construction of garland drain along the industry premises, lime treatment in the existing dump yards and surface water contaminated areas, regular water supply and periodical health camps to the affected people, implementation of the R & D Options for utilisation of iron oxide sludge, detailed assessment of affected areas for remediation of contaminated site as well as ground water as well as feasibility of acquisition of affected land and connection of the tube wells with tamper proof flow meter are the recommendations of the Joint Committee before the Hon'ble NGT. The report of the joint committee filed in this case is produced herewith as **Annexure 3.**

It is respectfully submitted that during the inspection held on 17/10/2022 and 9/12/2022, the Board had noticed that the unit is not complying with some of its consent conditions .Hence the Board had issued directions to the unit vide letter No.PCB/RO/KMML/NGT-OA NO. 502/2022 dated 04/02/2023 to comply with conditions such as to keep the quality of treated effluent with the consent norms, to

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REGIONAL OFFICE

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provide pH measurement facility at the outlet and maintain the records, to install the water meter to record the consumption of water, to install and maintain CAAQMS and OCEEMS and to furnish action taken report in this regard. Copy of the direction issued to the unit is submitted as **Annexure 4**.

Mean while the unit has proposed Geotube technology for sludge management which includes dewatering and storage of sludge in Geotubes. The technology being a new one the Board has directed the unit to present the details of technology before the technical committee of CPCB for approval vide letter dated 08/12/2022. The copy of the letter is produced as **Annexure 5**. Accordingly the proposal submitted by the unit before CPCB for approval.

It is respectfully submitted that the company had also requested the Board for shifting iron oxide residue to M/s Miracle Sands &Chemicals. Miracle Sands &Chemicals informed that they have obtained only Consent to Establish from TNPCB .Consent to operate will be issued only after inspecting the production of iron oxide concrete bricks from iron oxide residue for which a trail run needs to be conducted. Hence they requested to issue Authorisation as per Hazardous & Other Waste (Management and Transboundary Movement) Rules, 2016 for interstate transport of iron oxide sludge for conducting trial run. State PCB had sought advice to CPCB regarding the permission for interstate transport of Iron oxide sludge for manufacturing concrete bricks based on the detailed project proposal submitted by M/s Miracle Sands & Chemicals vide letter dated 24/09/2022.Copy of the letter is submitted as **Annexure 6**. The reply from CPCB is being awaited .

It is respectfully submitted that M/s. KMML shall ensure the implementation of all the action plans and the recommendations of the Joint committee in a time bound manner and the same shall be monitored by the Board.

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM

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It is respectfully submitted that further action on the proposals for sludge management will be taken by Board in compliance with advice from CPCB.

All the facts stated above are true to the best of my knowledge information and belief.

Dated this the 7th day of February, 2023.

KERALA STATE POLLUTION CONTROL BOARD
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THIRUVANANTHAPURAM

Chief Environmental Engineer,
Kerala State Pollution Control Board,
Regional Office, Thiruvananthapuram.

SREEKALA S.
Chief Environmental Engineer

Solemnly affirmed and signed by the deponent who is known to me on this the 7th day of February 2023.

Annexure 1

1710/RO
16/09/2022

☎: General: 0471- 2312910, 2318153, 2318154, 2318155 Chairman: 2318150 Member Secretary: 2318151
E-mail: ms.kspcb@gov.in FAX: 0471 – 2318134, 2318157 web: www.keralapcb.nic.in

KERALA STATE POLLUTION CONTROL BOARD
കേരള സംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്
Pattom P.O., Thiruvananthapuram – 695 004
പട്ടം പി.ഒ., തിരുവനന്തപുരം – 695 004

PCB/HO/SEE-1/NGT/O.A.No.502/2022 Date: 15/09/2022

AUTHORISATION

Sub: OA. No.502/2022 before the Hon'ble NGT

The Chief Environmental Engineer, Regional Office, Thiruvananthapuram is hereby authorized to represent the Board in the above O.A.

For and on behalf of the

KERALA STATE POLLUTION CONTROL BOARD

CHAIRMAN

To

The Chief Environmental Engineer
Regional Office
Thiruvananthapuram

AE2
16/9/2022

Copy to:

1. The Environmental Engineer
   Legal Cell, Ernakulam
2. The Environmental Engineer
   District Office, Kollam
3. Adv. Jogy Scaria
   Advocate-on-Record
   Supreme Court of India
   SB-41, Sophia Apartment,
   Abhaykhand-4, Indirapuram
   Ghaziabad, UP-201010
   (O) 01204264302

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Annexure 2

WATER CONSUMPTION DIAGRAM

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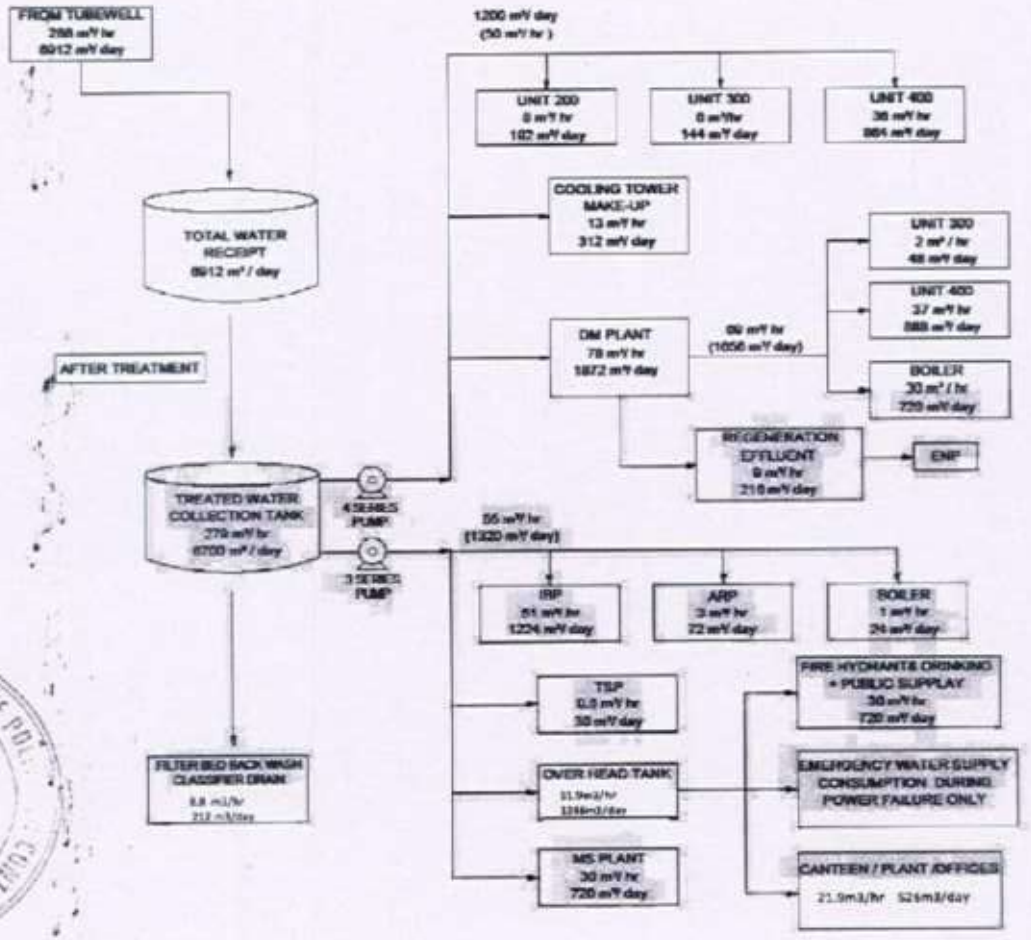

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Chief Environmental Engineer

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Annexure 3

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEWDELHI

IN

ORIGINAL APPLICATION NO. 502 of 2022

Petitioner : Padmakumar

Versus

Respondent(s) : The State of Kerala

REPORT OF THE JOINT COMMITTEE FILED BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEW DELHI IN THE MATTER OF O.A. NO. 502/2022.

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BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEWDELHI

IN

ORIGINAL APPLICATION NO. 502 of 2022

Petitioner : Padmakumar

Versus

Respondent(s) : The State of Kerala

Index

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2	**Annexure 1** – Copy of the Hon'ble NGT order dated 29/08/2022	70-72
3.	**Annexure 2**- Copy of the Hon'ble NGT order dated 13/12/2022	73-76
4	**Annexure 3**- Details of water consumption	77
5	**Annexure 4**- Details of material balance	78-85
6	**Annexure 5** – Minutes of Joint Committee meeting held on 01/12/2022	86-89
7	**Annexure 6**- Minutes of Joint Committee meeting and Site inspection at KMML held on 09/12/2022	90-96

Dated this the 31st day of January 2023

REGIONAL OFFICE

SREEKALA
Chief Environmental Engineer

SREEKALA S.
Chief Environmental Engineer

BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL

PRINCIPAL BENCH, NEWDELHI

IN

ORIGINAL APPLICATION NO. 502 of 2022

Petitioner : Padmakumar

Versus

Respondent(s) : The State of Kerala

REPORT OF THE JOINT COMMITTEE FILED BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL, PRINCIPAL BENCH, NEW DELHI IN THE MATTER OF O.A. NO. 502/2022.

1. Background

The Hon'ble National Green Tribunal (NGT) Principal Bench, New Delhi has registered O.A No. 502 of 2022 based on a letter petition received from Sri. Padmakumar regarding pollution caused by M/s. Kerala Minerals and Metals Limited (hereafter referred as M/s. KMML) situated in Chavara, Kollam District, Kerala. The Hon'ble NGT vide order dated 29/08/2022 had constituted a Joint Committee comprising of;

1. Principal Secretary, Industries & NORKA
2. Central Pollution Control Board

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3. State Pollution Control Board

4. State Wetland Authority

5. District Collector, Kollam

The State Pollution Control Board is the nodal agency for co-ordination and compliance. Mrs. Sreekala S., The Chief Environmental Engineer, KSPCB, Regional Office, Thiruvananthapuram has been nominated as a member of the above Committee and to represent Kerala State Pollution Control Board vide proceedings No. PCB/HO/SEE-1/NGT/O.A.NO.502/2022 dated 15/09/2022.

The Hon'ble NGT has directed the committee to meet within two weeks, undertake visits to the site, look into the grievances of the applicant, associate the applicant and representative of the concerned project proponent, verify the factual position and submit its report within one month.

Kerala State Pollution Control Board being Nodal Agency for ensuring compliance to the Hon'ble NGT order dated 29.08.2022, filed an interim status report before Hon'ble NGT vide email dated 29.11.2022 seeking additional time for filing report of the Joint Committee. Hon'ble NGT further passed order on 13.12.2022 in the said matter and relevant portion of the Hon'ble NGT directions is reproduced below:-

5. *The Joint Committee is directed to submit its further report by 31.01.2023 by email at judicial-ngt@gov.in preferably in the form of searchable PDF/OCR Supported PDF and not in the form of Image PDF.*

11. *List for further consideration on 06.03.2023.*

Copies of the Hon'ble NGT orders dated 29.08.2022 and 13.12.2022 are enclosed as **Annexure-1 and Annexure - 2.**

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2. About the M/s. KMML Industry, Process, Effluent Treatment and Waste Management - Overview

M/s. KMML is a fully integrated rutile grade titanium dioxide plant under Government of Kerala and its TiO_2 pigment unit was commissioned in 1984 at Sankaramangalam, Chavara, Kollam, Kerala with a titanium dioxide manufacturing capacity of 1459.125 TPA. Presently, the industry is involved in manufacture of titanium dioxide at 100 TPD (average). Satellite imagery of M/s KMML including the waste disposal area is depicted in **Figure.1** below.

Figure 1. Satellite Imagery of M/s KMML including the Waste Disposal Area

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2.1. Titanium Dioxide Manufacturing Process

M/s. KMML produces titanium dioxide from ilmenite mineral ore through the chloride process. The units in the titanium pigment factory include Ilmenite Beneficiation Plant, Chlorination Plant, Oxidation Plant and Pigment Finishing Unit. In the ilmenite beneficiation plant the raw Ilmenite containing 58 -60% of Titanium Dioxide is beneficiated to 90% Titanium Dioxide content. The major operations in Ilmenite Beneficiation Plant include Roasting/ Reduction, Digestion/ Leaching and Calcination. In the acid regeneration plant the spent leach liquor from digester is processed in a spray roster in which the liquid spray entering the furnace is atomized at high temperature (650 to 850^{o}C) in presence of air. The spent liquor then decomposes to solid metallic oxides and Hydrochloric Acid. The acid is absorbed in water and pumped back for digestion. The metallic oxides, mainly iron oxide, are slurried and stored in secured ponds. In the chlorination plant Beneficiated Ilmenite from Ilmenite Beneficiation Plant is chlorinated to produce Titanium Tetra Chloride. In the oxidation plant the Titanium Tetra Chloride is vaporized, preheated and oxidized with oxygen to produce raw Titanium Dioxide pigment at high temperature (1050^{o}C). The by-product chlorine is recycled to the chlorination plant. Raw titanium dioxide is slurried and pumped to the pigment finishing unit. In the pigment finishing unit the treated slurry is then washed and filtered. The filter cake is then subjected to drying to drive off the moisture followed by micronization. The micronized final pigment is then bagged using an automatic bagging machine. At present, for production of TiO_2 pigment, raw materials consumption i.e., ilmenite mineral ore (1.65 MT of raw ilmenite/ MT of Beneficiated Ilmenite (BI) -120 TPD of BI), Chlorine (0.115 MT of makeup chlorine/MT of $TiCl_4$ – 270 TPD of $TiCl_4$), Hydrochloric acid (0.85 MT of makeup acid/ MT of Beneficiated ilmenite- 120 TPD of BI). Water

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consumption (6912 m^3/day). TiO_2 pigment Manufacturing process details is given in **Figure.2.**

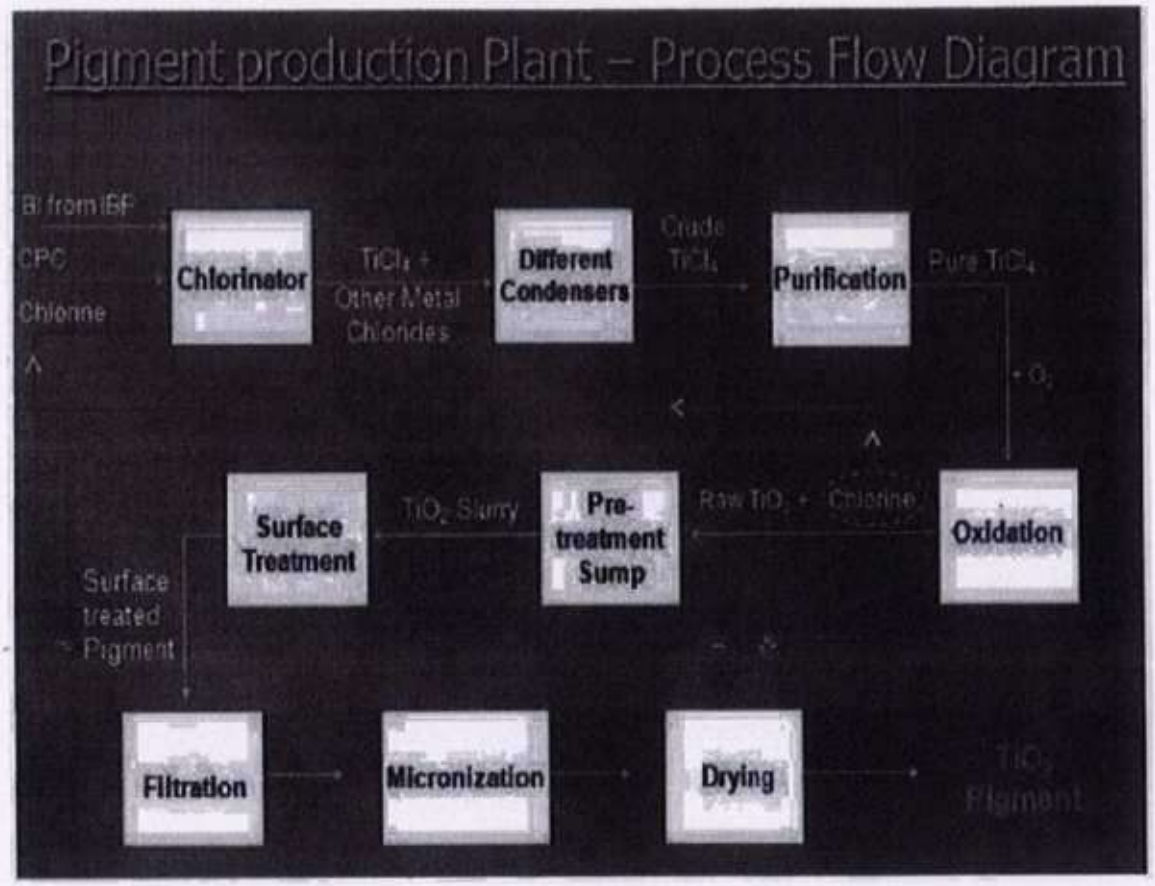

Figure.2. TiO_2 pigment Manufacturing Process

2.2. Status of Integrated Consent to Operate issued to M/s. KMML under The Environment (Protection) Act, 1986

The unit is having an integrated consent to operate including authorisation renewed on 13/09/2021 with validity up to 31/07/2025 for TiO_2 production of 120 tonnes/day (TPD). As per integrated Consent issued to M/s.KMML, the industrial unit is categorised as Red Category, total water consumption is 11,728 m^3/day from 14 tube wells located within the industry premises and the maximum quantity

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of treated effluent discharged into the sea shall not exceed 4800m^3/day. Also, as per the consent condition, the unit shall install pH online measurement facility at the outlet, water meters shall be fixed to record consumption of water. Also, the process sludge i.e., iron oxide sludge (21.1 Category) quantity 50 TPD shall be stored in secured lined ponds and thereafter dewatered and disposed in Common Treatment Storage and Disposal Facility (CTSDF) at Kochi. CAAQMS (Continuous Ambient Air Quality Monitoring Station) and OCEEMS (Online Continuous Effluent and Emission Monitoring System) shall be installed and record maintained. The discharge norms of treated effluent prescribed under the Integrated Consent to Operate issued to M/s. KMML is given in the **Table 1** below.

Table 1. Tolerance Limit of Treated Effluent Prescribed to M/s.KMML

Sl. No.	Characteristics	Unit	Tolerance Limit
1	pH	mg/l (Max)	5.50 to 9.0
2	Suspended Solids	mg/l (Max)	100
3	Oil & Grease	mg/l (Max)	20
4	Total Residual Chlorine (as Cl)	mg/l (Max)	1.0
5	Total Chromium(as Cr)	mg/l (Max)	2.0
6	Zinc (as Zn)	mg/l (Max)	15.0
7	Titanium (as Ti)	mg/l (Max)	5.0
8	Lead (as Pb)	mg/l (Max)	2.0
9	Vanadium (as V)	mg/l (Max)	0.2
10	Manganese (as Mn)	mg/l (Max)	2.0
11	Iron (as Fe)	mg/l (Max)	3.0
12	Total Heavy Metals	mg/l (Max)	7.0

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2.3. Water Consumption and Wastewater Effluent Treatment

As per the information provided by M/s KMML, there are 14 ground water tube wells within the industry premises of M/s. KMML. Presently, the water consumption is reported to be about 6912 m^3/day. Waste water generation is 3642 m^3/day (Maximum) and a maximum of 1200 m^3/day of treated effluent from the existing ETP is discharged through the approved outlet into the sea from the ETP settling pond. The details of water consumption and material balance are submitted as **Annexure 3 & Annexure 4** respectively. The flow diagram of ETP operated by M/s. KMML is shown in **Figure. 3.**

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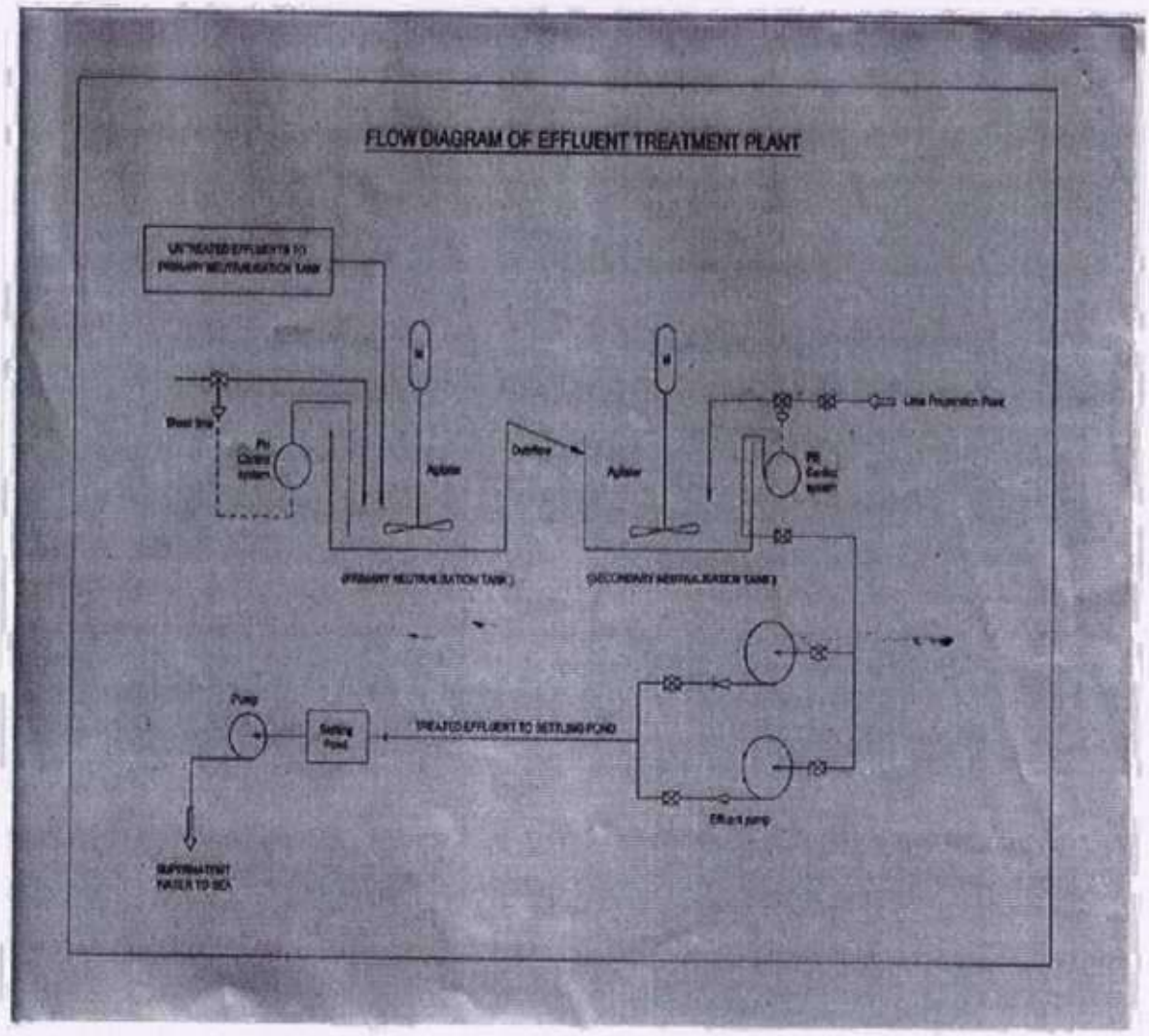

Figure 3. Flow Diagram of Effluent Treatment Plant operated by M/s.KMML

As per the information provided by M/s.KMML, at present the wastewater effluent is generated at about 3642 m^3/day, as a part of the TiO_2 manufacturing process. Effluent from all the process units (i.e., mainly ilmenite beneficiation plant, acid regeneration plant, and pigment production plant) are pumped to the primary neutralization tank (PNT) and neutralized with the lime scrubber provided. pH is monitored in the PNT and is maintained around 4-5 by the addition of lime solution and the retention time is about 60 minutes. The liquid in the primary

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neutralization tank overflows into the secondary neutralization tank. In addition to the overflow from the primary neutralization tank, the effluents from various units of the pigment production plant (pH less than 4.5) are fed into the secondary neutralization tank. Overflow from primary neutralization tank, bleed lime from scrubber, effluent from area sump, effluent from solid waste tank and lime from lime preparation plant are the effluents neutralized in secondary neutralization tank. The retention time of the contents in the tank is around 25 minutes to 35 minutes and pH is maintained at 7-8. Neutralized Effluent is pumped to holding ponds. The treated effluent in the pond is periodically pumped to sea. It was reported by the industry that the quantity of lime added is about 40-50 MT/day. *However, pH meter and neither OCEEMS including flow meter not installed to the outlet before discharging of treated effluent in to the sea, for real time assessment of compliance to effluent discharge norms and total effluent discharged in to sea.*

2.4. ETP Waste and Iron Oxide Waste Management Scenario

M/s. KMML used to generate iron oxide sludge from acid regeneration plant at about 1451 TPA in the year 1985 and ETP sludge from the Effluent Treatment Plant, at around 729 TPA in the year 1984 and the generated wastes were stored within the industry premises in two number of old iron oxide ponds (claimed to have single LDPE liner with brick lining beneath) as well as two old ETP sludge ponds, which have already been filled and are not capped (as per CPCB guidelines issued in February 2001). As per M/s.KMML total quantum of iron oxide sludge stored in two old ponds was about 2,00,000 MT generated during the period 1985-2008 and ETP sludge from the Effluent Treatment Plant stored about 2,00,000 Metric Tonnes generated during the period 1984-2008, within the industry premises. As per information provided by M/s. KMML, the dimensions of the old ponds are given in the **Table 2** below

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Table 2: Dimensions of Old Ponds within M/s. KMML Premises

Sl.No	Pond	Dimensions in metres	Area	Waste Stored Depth in metres
1	Iron oxide pond I	80x168	13440 sq.m.	4.5
2	Iron oxide pond II	71x174	12354 sq.m.	4.5
3	ETP settling pond I	69x267	18423 sq.m.	4.5
4	ETP settling pond II	77x246	18942 sq. m.	4.5

At present, as informed by M/s.KMML, TiO_2 pigment production is about 100 TPD and in the process, the iron oxide sludge from acid regeneration plant is generated (around 75 Tonnes per day (TPD) and ETP sludge from the Effluent Treatment Plant (around 50 TPD). Both iron oxide and ETP sludge are presently stored separately in two ponds constructed above the ground level with a liner system, in the year 2008. Capacity of the iron oxide pond constructed above the ground level is 1,35,200 m^3 and whereas the ETP pond capacity is 2,76,560 m^3 and at present, the capacity of the iron oxide and ETP sludge ponds are almost exhausted.

As per the records of District Office , Kollam, during the late 80's and early 90's due to failure of the liner of the iron oxide pond of the industry, acid from sludge pond had leaked into soil causing pollution of the soil and groundwater of the nearby area. Following this, a number of cases were filed against the industry before the Hon'ble Court of Kerala and the Hon'ble NGT. These underground ponds were abandoned in 2008 and a new pond (pond 3) was constructed. The details of the new ponds constructed in the year 2008 shown in **Table 3** below.

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Table 3: Details of New Iron Oxide Sludge Pond and ETP Pond Constructed in the year 2008

Details	Iron Oxide Pond	ETP Pond
Area	33800 m^2	34570 m^2
Depth	4 m	8 m
Solid storage capacity	101400 m^3	241990 m^3
Total capacity of pond	135200 m^3	276560 m^3

M/s. KMML vide letter dated 08/01/2018 had requested Chairman, Kerala SPCB to temporarily transfer and store the iron oxide sludge from new pond (after neutralization maintaining a pH around 5) to the old ponds providing proper lining (with HDPE) and other precautionary measures and the Kerala SPCB had granted in principle clearance for the removal and transfer of iron oxide from pond no. 3 to pond no. 1 in strict compliance with directions issued in May 2018. Meanwhile, the company had obtained Integrated Consent to Establish (ICE) on 3/10/2018 for construction of a new iron oxide pond, but the work is not yet started. The company again requested for the temporary transfer of iron oxide from pond 3 to pond1 and pond 2. As per the meeting held on 06/11/2019, it was decided that the request cannot be permitted as pH of the slurry in the old pond was around 2 as per the report from Environmental Engineer, District Office, Kollam. During March 2020, the industry again requested to issue sanction for iron oxide sludge to M/s Miracle Sand and Chemicals, Tuticorin for processing the same in their facility at Tuticorin, Tamil Nadu. But the Board denied their request on 26/06/2020 as the

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iron oxide sludge is not exempted from Hazardous waste category. Later as per the request from KMML, the Board had issued In- Principle Clearance vide letter dated 05/04/2021, for the removal and transfer of iron oxide from new pond to old pond, existing within the company premises, in strict compliance with the following directions.

1 The storage capacity and safety aspects of old pond shall be assessed and quantity beyond the capacity shall not be transferred.
2 The pH of transferring material from new pond shall be checked and neutralized at each time of transfer.
3 While transferring, the structural stability of the tanks shall not be affected.
4 The material shall be transported in leak proof vehicle and shall not spill over the plant premises.
5 The safety aspect shall be ensured at each stage by the Concerned Safety Department.

Since the third pond is reported to be almost completely filled and in the light of the upcoming monsoon season, the Board restricted the permission, for transfer of iron oxide sludge, to the monsoon season as per the decision in the meeting held on 16/05/2022. After receiving repeated complaints from nearby residence of Panmana, Chittoor and nearby areas of M/s. KMML, the Board had inspected the unit and not permitted the transfer of iron oxide sludge from new pond to old pond. It was reported by industry that 22500 MT of iron oxide is transferred from new pond to old ponds till now. The Board Vide letter dated 23/08/2022, issued directions to transfer the iron oxide slurry to M/s. Kerala Enviro Infrastructure Limited (M/s.KEIL) for scientific disposal in accordance with the Hazardous and Other Waste (Management & Transboundary Movement) Rules 2016 as well as

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guidelines issued by CPCB. But the industry has reported that they have not initiated disposal of iron oxide to common TSDF as this activity was kept in abeyance from 08/08/2014 as directed by the Kerala State Government and presently awaiting reply from Principal Secretary regarding the review of transportation and disposal of iron oxide from M/s. KMML to Common Hazardous Waste Treatment and Disposal Facility (CHWTSDF) of M/s. KEIL located at Ambalamugal.

It was reported that about 1,70,454 MT of ETP sludge generated from April 2011 to March 2022. M/s. KMML had obtained permission from Kerala SPCB vide letter No. PCB/HO/KLM/ICO/08/08 dated 26/06/2020 for transfer 50,000 MT of ETP sludge to M/s. Miracle Sands & Chemicals, Tuticorin for processing and utilization. 10000 MT was already transferred during the month of June 2020, but they could not transfer the entire quantity due to Covid pandemic situation. Permission was granted by the Hon'ble Chairman vide letter No. PCB/HO/KLM/MIRACLE SANDS & CHEMICALS/2020 dated 22/08/2022 to M/s. Miracle Sands & Chemicals, Tuticorin for collection and transportation of the remaining 40000 MT of ETP sludge from M/s. KMML before 31/03/2023 without causing any environmental pollution and by taking necessary precautionary measures following the guidelines as applicable.

3. Initiatives of Kerala State Pollution Control Board including Joint Committee Meetings and the Field Visit

In compliance with the Hon'ble NGT order dated 29.08.2022 passed in O.A. No. 502/2022, Kerala State Pollution Control Board organised **first meeting** of the joint committee on **11/10/2022** through Video Conference in the chamber of Chief Environmental Engineer, KSPCB, Regional Office, Thiruvananthapuram.

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As per the decisions taken in the first meeting, **joint committee visit to M/s KMML** industry and its premises was organised **on 17/10/2022** to hear the complainant and the industry representatives. *During the visit , the joint committee also gave an opportunity to Sri. Padmakumar, the applicant in O.A. No. 502/2022 and heard the grievances of the applicant and the nearby residents. The Joint Committee also visited the affected areas such as Panmana, Chittoor, near the storm water discharge point of M/s. KMML, a nearby canal leading to Ashtamudi Estuary and Porookkara and the Vattakkayal and nearby affected residential areas in the presence of the applicant (Sri. Padmakumar).* During the visit of Joint Committee to the surrounding affected residential areas, the officials of Kerala State Pollution Control Board also collected 18 number of water samples which include surface water/stagnant water/ground water and the sampling locations are shown in **Figure 4.**

Location details of the water samples collected during the visit of Joint Committee is given in the **Table 4** below.

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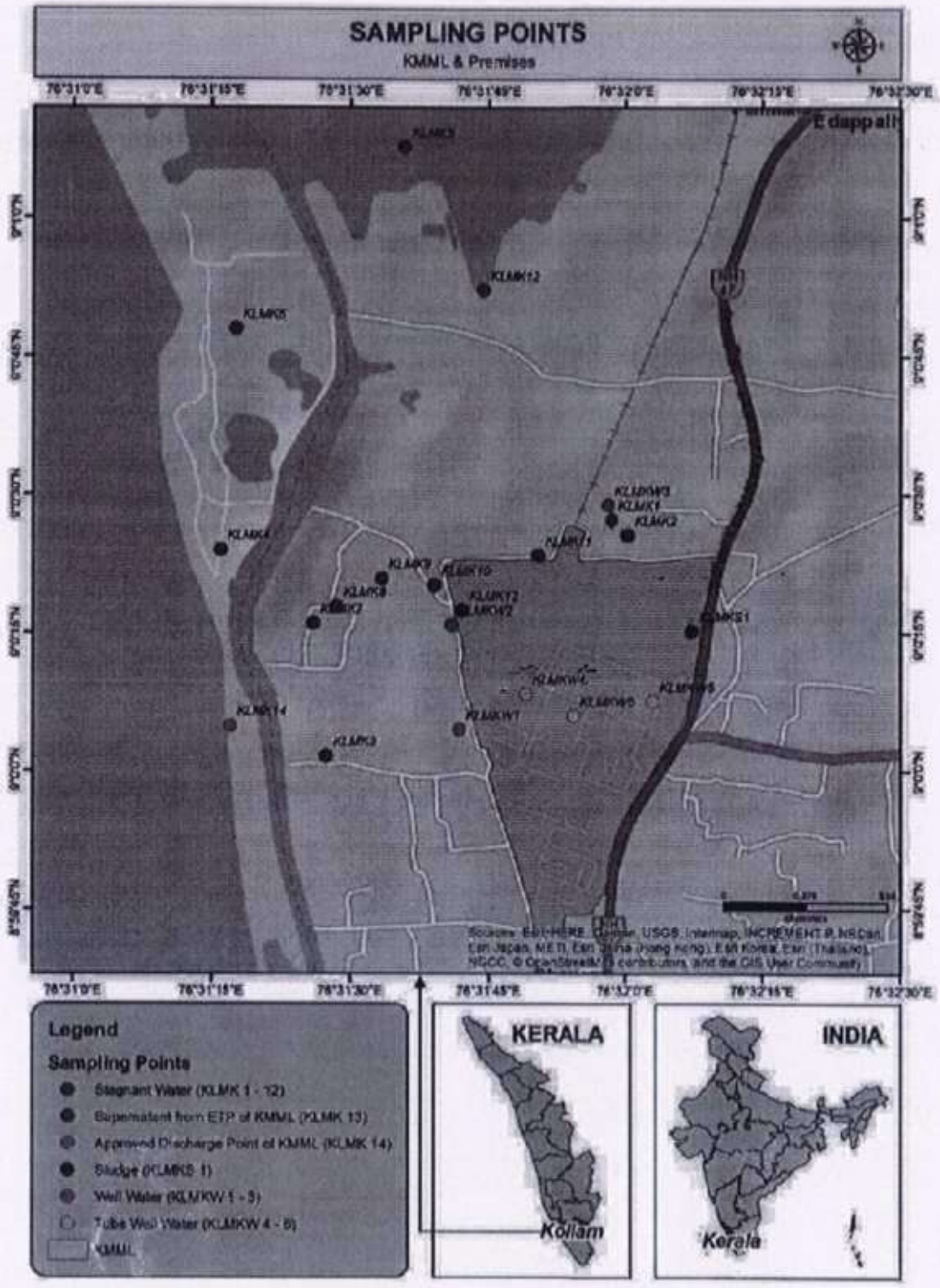

Figure 4. Water Sampling Locations dated 17.10.2022

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Table 4. Location Details of the water samples collected during the visit of Joint Committee on 17/10/2022.

SAMPLE NUMBER	LOCATION POINT	LATITUDE	LONGITUDE
KLMK1	Stagnant water at north side of KMML ,backside of Hind Erectors Engineering Workshop(near home) in Panmana ward	9.007583	76.532935
KLMK2	Stagnant water at north side of KMML (backside Hind Erectors Engineering Workshop) in Panmana ward	9.007121	76.533434
KLMK3	Canal near MS Plant (drainage joining point) in Mekkad ward	9.000452	76.524285
KLMK4	T S Canal (while boating)	9.00666667	76.5211111
KLMK5	Stagnant water in Chittoor ward	9.018808333	76.5266111
KLMK6	Stagnant water near the house of Mr. Benedict,Mary Mandiram ,Chittoor,Panmana	9.013319	76.521565
KLMK7	Stagnant water near the house of Mr.Anandan,Vaishnokripa,Chittoor,Panmana	9.004451	76.5238962
KLMK8	Drainage water in frontof the house of Mr. Ajikumar,Aji Nivas,Chittoor,Panmana	9.004957	76.52458
KLMK9	Front side of Karungayil temple,Chittor,Panmana.	9.0058	76.525936
KLMK10	Right side of Gurumandiram, Chittoor, Panmana	9.005607	76.527518
KLMK11	North side outside KMML(storm water drain pipe from KMML compound	9.006509	76.530682
KLMK12	Point near Vattakayal	9.014487	76.52901
KLMK13	Supernatent from ETP of KMML	9.00485	76.52836
KLMK14	Approved discharge point of KMML (sea discharge)	9.001358	76.521407
KLMKS1	Sludge from KMML near ETP pond	9.004221	76.535363
KLMKW1	Well water from SasidharanPillai,Thengumpally, Chittoor,Chavara	9.00125	76.52828

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SAMPLE NUMBER	LOCATION POINT	LATITUDE	LONGITUDE
KLMKW2	Well water from Babu,BabuSadhanam,Chittoor ,Chavara	9.004408	76.528048
KLMKW3	Well water from Mohanan Pillai,Edapallil,Panmana,Chavara	9.008018	76.532833
KLMKW4	KMML Tube Well no-2	9.002332	76.530296
KLMKW5	KMML Tube Well no-4	9.002102	76.534188
KLMKW6	KMML Tube Well no-8	9.001671	76.531779

The stagnant water samples were collected from North side of M/s KMML in Panmana, Chitoor, near the house of Mr. Benedict and Mr. Anandan in Chitoor, front side of Karungayil temple and right side of Gurumandiram, Chittoor. The samples were collected from Canal near MS plant in Mekkad ward, T S canal (while boating), drainage in front of the house of Mr. Ajikumar, North side of M/s. KMML (storm water drain pipe from M/s.KMML compound), point near Vattakkayal. The committee also inspected the industrial unit and the samples from the ETP pond (supernatant), Iron Oxide Sludge pond and approved effluent discharge outlet point of M/s. KMML were also collected. Photographs taken during the site visit and sampling in the vicinity of human habitation around M/s. KMML on 17.10.2022 sit depicted in **Figure 5** to **Figure 9** below.

Figure 5. Meeting with the Officials of M/s. KMML held on 17.10.2022

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Figure 6. Interaction with local public on 17.10.2022 by the Joint Committee

Figure 7. Sampling of stagnant water and well water near M/s KMML on17.10.2022

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Figure 8. Sampling Location near Vattakkayal

Figure 9. Sample collected at the effluent discharge outlet of M/s. KMML in to sea on 17.10.2022

The water and sludge samples collected were forwarded to Central Laboratory, KSPCB, Ernakulum and the digested samples were sent to Regional Lab of Regional Directorate, CPCB, Bengaluru for further analysis of general parameters

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and heavy metals respectively. The analysis results of the samples collected during the Joint Committee visit on 17.10.2022 are given in **Table 5, 6, 7 &8** in subsequent paras.

Table 5. The Analysis Results of the stagnant water samples collected on 17/10/2022.

SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
1	KLMK 1	Stagnant water at north side of KMML ,backside of Hind Erectors Engineering Workshop (near home) in Panmana ward	pH	2.30	5.5 - 9.0
			Total Suspended solids	708.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	1424.00	3 mg/L
			Manganese	30.90	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	7.00	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.57	0.2 mg/L
			Titanium	BDL	Nil
2	KLMK 2	Stagnant water at north side of KMML (backside Hind Erectors Engineering Workshop) in Panmana ward	pH	2.10	5.5 - 9.0
			Total Suspended solids	520.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L

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SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Iron	3528.00	3 mg/L
			Manganese	102.00	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.89	0.2 mg/L
			Titanium	BDL	Nil
3	KLMK 3	Canal near MS Plant (drainage joining point) in Mekkad ward	pH	2.40	5.5 - 9.0
			Total Suspended solids	187.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	294.00	3 mg/L
			Manganese	14.70	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.17	0.2 mg/L
			Titanium	BDL	Nil
4	KLMK 4	T S Canal (while boating)	pH	2.90	5.5 - 9.0
			Total Suspended solids	193.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L

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SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Total Chromium	BDL	2 mg/L
			Iron	78.23	3 mg/L
			Manganese	3.02	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	0.34	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.41	0.2 mg/L
			Titanium	BDL	Nil
5	KLMK 5	Stagnant water in Chittor ward	pH	2.40	5.5 - 9.0
			Total Suspended Solids	174.00	Nil
			Oil &' Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	286.00	3 mg/L
			Manganese	14.60	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	1.19	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.17	0.2 mg/L
			Titanium	BDL	Nil
6	KLMK 6	Stagnant water near the house of Mr. Benedict,Mary Mandiram,Chittor,Panmana	pH	2.40	5.5 - 9.0
			Total Suspended Solids	351.00	Nil
			Oil &' Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L

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SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	279.00	3 mg/L
			Manganese	12.50	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	2.59	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.14	0.2 mg/L
			Titanium	BDL	Nil
7	KLMK 7	Stagnant water near the house of Mr.Anandan, Vaishnokripa, Chittor,Panmana	pH	2.50	5.5 - 9.0
			Total Suspended Solids	310.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	200.00	3 mg/L
			Manganese	9.70	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	1.39	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.17	0.2 mg/L
			Titanium	BDL	Nil
8	KLMK 8	Drainage water in front of the house of Mr. Ajikumar, Aji Nivas,Chittor, Panmana	pH	2.30	5.5 - 9.0
			Total Suspended Solids	2033.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L

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SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	416.00	3 mg/L
			Manganese	15.20	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.24	0.2 mg/L
			Titanium	BDL	Nil
9	KLMK 9	Stagnant water in front side of Karungayil temple,Chittoor, Panmana.	pH	2.50	5.5 - 9.0
			Total Suspended Solids	407.00	Nil
			Oil &' Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	182.00	3 mg/L
			Manganese	6.34	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	0.31	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.12	0.2 mg/L
			Titanium	BDL	Nil
10	KLMK 10	Stagnant water in right side of Gurumandiram, Chittoor, Panmana	pH	3.10	5.5 - 9.0
			Total Suspended Solids	316.00	Nil
			Oil &' Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil

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SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	624.00	3 mg/L
			Manganese	19.20	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	2.60	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.56	0.2 mg/L
			Titanium	BDL	Nil
11	KLMK 11	North side outside KMML(storm water drain pipe from KMML compound	pH	2.50	5.5 - 9.0
			Total Suspended Solids	115.00	Nil
			Oil &' Grease	BDL	Nil
			Total Residual Chlorine	BDL	Nil
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	378.00	3 mg/L
			Manganese	15.80	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	2.90	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.47	0.2 mg/L
			Titanium	BDL	Nil
12	KLMK 12	Point near Vattakayal	pH	3.00	5.5 - 9.0
			Total Suspended Solids	194.00	Nil
			Oil &' Grease	BDL	Nil
			Total Residual	BDL	Nil

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SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per MoEF guidelines**
			Chlorine		
			Copper	BDL	3 mg/L
			Cadmium	BDL	2 mg/L
			Total Chromium	BDL	2 mg/L
			Iron	132.00	3 mg/L
			Manganese	5.00	2 mg/L
			Nickel	BDL	3 mg/L
			Lead	BDL	0.1mg/L
			Zinc	120.00	5 mg/L
			Arsenic	BDL	0.2 mg/L
			Vanadium	0.19	0.2 mg/L
			Titanium	BDL	Nil

** *Guidance document for assessment and remediation of contaminated sites in India*

Table 6: Analysis results of Supernatant from ETP pond and at the effluent discharge outlet point of M/s. KMML into sea on 17/10/2022

SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per Consent issued to M/s KMML
1	KLMK 13	Supernatant from ETP settling pond	pH	7.40	5.5-9.0
			Total Suspended Solids	80273	100 mg/l
			Oil & Grease	BDL	20 mg/l
			Total Residual Chlorine	BDL	1 mg/l
			Copper	BDL	nil
			Cadmium	BDL	nil
			Total Chromium	22.40	2 mg/l
			Iron	1818	3 mg/l
			Manganese	20.90	2 mg/l

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SL No	Sample code	Sample Location	Parameter	Observed Value	Limits as per Consent issued to M/s KMML
			Nickel	2.40	nil
			Lead	0.90	2
			Zinc	6.10	15
			Arsenic	BDL	nil
			Vanadium	3.12	0.2
			Titanium	268. 0	5
2	KLMK 14	Approved discharge point of KMML (sea discharge)	pH	7.00	5.5-9.0
			Total Suspended Solids	4515	100 mg/l
			Oil &' Grease	BDL	20 mg/l
			Total Residual Chlorine	BDL	1 mg/l
			Copper	BDL	nil
			Cadmium	BDL	nil
			Total Chromium	5.61	2 mg/l
			Iron	301	3 mg/l
			Manganese	4.20	2 mg/l
			Nickel	BDL	nil
			Lead	BDL	2
			Zinc	2.20	15
			Arsenic	BDL	nil
			Vanadium	5.87	0.2
			Titanium	41.60	5

Table 7: Analysis results of open well water collected near M/s KMML on 17.10.2022

SL No	Sample code	Sample Location	Parameters	Value	Acceptable Limit as per BIS Drinking Water Specification IS 10500-2012
1	KLMKW1	Well water from SasidharanPillai, Thengumpally.	pH	7.10	6.5-8.5
			Total Suspended Solids	26.00	Nil

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SL No	Sample code	Sample Location	Parameters	Value	Acceptable Limit as per BIS Drinking Water Specification IS 10500-2012
		Chittoor,Chavara.	Oil &' Grease	BDL	Nil
			Total Residual Chlorine	BDL	0.2 mg/L
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	BDL	0.05 mg/L
			Iron	0.79	0.3 mg/L
			Manganese	BDL	0.1 mg/L
			Nickel	BDL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.01 mg/L
			Vanadium	BDL	Nil
			Titanium	BDL	Nil
2	KLMKW2	Well water from Babu, Babu Sadhanam, Chittoor, Chavara	pH	3.10	6.5-8.5
			Total Suspended Solids	BDL	Nil
			Oil &' Grease	BDL	Nil
			Total Residual Chlorine	BDL	0.2 mg/L
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	B DL	0.05 mg/L
			Iron	5.70	0.3 mg/L
			Manganese	2.43	0.1 mg/L
			Nickel	BDL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	0.11	5 mg/L
			Arsenic	BDL	0.01 mg/L
			Vanadium	0.10	Nil
			Titanium	BDL	Nil
3	KLMKW3	Well water from Mohanan Pillai, Edapallil, Panmana, Chavara	pH	7.10	6.5-8.5
			Total Suspended Solids	4191.00	Nil
			Oil & Grease	BDL	Nil
			Total Residual	BDL	0.2 mg/L

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SL No	Sample code	Sample Location	Parameters	Value	Acceptable Limit as per BIS Drinking Water Specification IS 10500-2012
			Chlorine		
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	BDL	0.05 mg/L
			Iron	225.00	0.3 mg/L
			Manganese	1.00	0.1 mg/L
			Nickel	BDL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.01 mg/L
			Vanadium	BDL	Nil
			Titanium	BDL	Nil

Table 8: Analysis results of tube well water collected inside M/s KMML

SL No	Sample code	Sample Location	Parameter	Value	Acceptable Limit as per BIS Drinking Water Specification IS 10500-2012
1	KLMKW4	KMML Tube Well no-2	pH	6.70	6.5-8.5
			Total Suspended Solids	BDL	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	0.2 mg/L
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	BDL	0.05 mg/L
			Iron	2.70	0.3 mg/L
			Manganese	BDL	0.1 mg/L
			Nickel	BDL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.01 mg/L

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SL No	Sample code	Sample Location	Parameter	Value	Acceptable Limit as per BIS Drinking Water Specification IS 10500-2012
			Vanadium	BDL	Nil
			Titanium	BDL	Nil
3	KLMKW5	KMML Tube Well no-4	pH	6.70	6.5-8.5
			Total Suspended Solids	11.0	Nil
			Oil & Grease	BDL	Nil
			Total Residual Chlorine	BDL	0.2 mg/L
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	BDL	0.05 mg/L
			Iron	1.20	0.3 mg/L
			Manganese	BDL	0.1 mg/L
			Nickel	B DL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.01 mg/L
			Vanadium	BDL	Nil
			Titanium	BDL	Nil
6	KLMKW6	KMML Tube Well no-8	pH	7.00	6.5-8.5
			Total Suspended Solids	BDL	Nil
			Oil &' Grease	BDL	Nil
			Total Residual Chlorine	BDL	0.2 mg/L
			Copper	BDL	0.05 mg/L
			Cadmium	BDL	0.003 mg/L
			Total Chromium	BDL	0.05 mg/L
			Iron	0.49	0.3 mg/L
			Manganese	BDL	0.1 mg/L
			Nickel	BDL	0.02 mg/L
			Lead	BDL	0.01 mg/L
			Zinc	BDL	5 mg/L
			Arsenic	BDL	0.01 mg/L
			Vanadium	BDL	Nil
			Titanium	BDL	Nil

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Table 9: Analysis results of Iron Oxide Sludge sample collected on 17/10/2022

SL No	Sample code	Sample Location	Parameter	Observed Value (in mg/Kg except pH)
1	KLMKS1	Iron Oxide Sludge from KMML near ETP pond	pH	1.80
			Copper	BDL
			Cadmium	BDL
			Total Chromium	377.85
			Iron	173613.50
			Manganese	2306.89
			Nickel	BDL
			Lead	BDL
			Zinc	BDL
			Arsenic	BDL
			Vanadium	544.90
			Titanium	BDL

The analysis results of the samples collected during the visit of Joint Committee to the affected residential areas on 17/10/2022 reveal that all the stagnant water samples collected from the nearby premises of the industry, the canal near MS plant, TS canal and near Vattakkayal had acidic pH in the order of 2-3. The parameters such as Iron and Manganese were exceeding the limits in all these locations. Zinc exceeded in Northern side of M/s. KMML in Panmana and near Vattakkayal and Vanadium exceeded in some of the locations. The highest value of Iron is found as 3528 mg/l at North side of M/s.KMML in Panmana ward. The parameters such as Oil and grease, Total residual chlorine, Copper, Cadmium, Total chromium, Nickel, Lead, Arsenic and Titanium for all the samples collected outside the industry were Below Detectable Limit (BDL).

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The samples collected from the ETP pond (supernatant) and treated effluent discharge outlet point of M/s. KMML shows neutral p^H whereas the parameters such as Total Suspended Solids, Total Chromium, Iron, Manganese, Vanadium, and Titanium were exceeding the limits prescribed under the Integrated Consent to Operate issued to M/s. KMML, which clearly indicates that the existing effluent treatment plant is not adequate to comply to effluent discharge norms.

One of the ***well water sample*** *(i.e., KLMKW2- Well water from Babu, Babu Sadhanam, Chittoor, Chavara) shows an acidic pH of 3.1 and the parameters such as Iron and Manganese are exceeding the limits of BIS Drinking Water Specifications i.e., IS 10500:2012.* The other two well water samples shows neutral pH and the value of Iron exceeds BIS Drinking Water Specification.

The tube well water samples collected from M/s. KMML shows a neutral pH of nearly 7 and also shows iron content. The tube wells are considerably deep and could be the reason for neutral pH of the water.

The parameters such as Iron, Manganese, and Vanadium were present in the iron oxide sludge sample. All these parameters were exceeding the limits (as per MoEF guidelines) in the stagnant samples collected from the nearby premises. It may be inferred that there is every possibility of leakage or runoff from iron oxide sludge from the company to the nearby premises.

Kerala State Pollution Control Board organised meeting of the joint committee on 01/12/2022 to discuss the analysis results of the samples collected during the visit to affected areas on 17.10.2022. Kerala State Pollution Control Board officials apprised the Joint Committee that

- The analysis results of stagnant water collected on 17/10/2022 is compared with MoEF&CC Guidance document for assessment and remediation of

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contaminated sites in India, with respect to surface water and the parameters of well water is compared with the BIS Drinking Water Specifications (I.S. 10500:2012).

- The analysis of the stagnant water samples collected from the nearby area of the company show acidic pH and presence of heavy metals. All the three well water samples also show high concentration of iron and one sample shows acidic pH. It is understood that the nearby area is polluted and the well water are not fit for drinking purpose.
- The storm water sample (KLMK11) of the industry show acidic pH and presence of Iron, Manganese and Vanadium which implies that the land inside the industry is either polluted or there is a possibility of leakage / spillage of iron oxide sludge into nearby area including Vattakayal.
- The treated effluent sample from the industry shows total suspended solids and heavy metals above the limit specified which implies that the present treatment system is not adequate enough to comply with the effluent discharge standards and requires upgradation.
- The analysis of the stagnant water samples collected from the nearby area of the company show acidic pH and presence of heavy metals.
- All the three well water samples also show high concentration of iron and one sample shows acidic pH.
- It is understood that the nearby area are polluted and the wells are not fit for drinking purpose.
- The treated effluent sample from the industry shows total suspended solids and heavy metals above the limit specified which implies that the present treatment system is to be modified.
- The analysis results of the collected effluent discharge sample revealed that the parameters are exceeding the limits permissible under the consent norms,

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and also existing effluent treatment system consisting of neutralization using lime followed by settling tank, which is not adequate for removal of heavy metals and also to comply with the effluent discharge norms. Therefore, the existing effluent treatment system should be upgraded to ensure compliance to the consent discharge norms.

- Based on the observations made during the visit that there is every chance of runoff from the existing iron oxide pond area especially during monsoon resulting pollution of nearby land. In order to avoid this, scientific approach should be followed in line with the guidelines issued by CPCB from time to time.
- KSPCB and the Members of the Joint Committee were of the view that proper sign boards should be placed at all the suitable places to avoid human/ animal contact with the polluted stagnant water bodies in the vicinity of the human habitation.

As a follow-up of the decision taken in the Joint Committee meeting held on 01/12/2022, the basic findings of the committee regarding the matter were shared with the company authorities, in compliance to the Hon'ble NGT' order dated 29.08.2022. Joint Committee **meeting was also convened on 09/12/2022** at M/s KMML and the Joint Committee held discussions with the officials of M/s. KMML on the status of remedial measures (both short term and long term measures) to curtail the pollution. The representatives of M/s. KMML apprised Joint Committee in the meeting that

- A German company viz., M/s Tetrabic, approached to construct a plant inside the M/s.KMML for converting the ETP sludge and iron oxide sludge into usable products and this project is pending for State Government Approval. At present, the ETP sludge (about 50000 Tonnes) is being

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transferred to M/s. Miracle Sands and Chemicals in Tamilnadu for processing and further utilization with the approval of the Kerala State Pollution Control Board (KSPCB). As on date, about 10000 Tonnes of ETP sludge already transferred to M/s. Miracle Sands and Chemicals in Tamilnadu.

- An internal R & D team of M/s. KMML has developed a new technology of converting acidic iron oxide sludge into neutral metallic iron and the samples are sent to some steel industries and waiting for their response for utilizing as raw material.

- The R & D wing of M/s. KMML also came up with additional techniques which are under trial run. One technique was tested within the company and found successful. About 2 to 3% of their profit is presently spent towards social commitment.

- Under the social responsible and commitment activities, which include welfare activities in 7 wards including the drinking water supply, sanitation and also conducting of regular medical camps etc.

- As a short term measure, trial for remediation of affected land is under progress and the same will be implemented to remediate the land outside the company premises, upon successful results. However, the permanent solution for this issue is acquisition of 76 acres of affected land around the company. Earlier 183 acres were identified and out of that 76 acres were the most affected area and the company have active plan to take up that land. The capping of the existing ponds can also be done to avoid contaminated runoff.

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The minutes of the Joint Committee meetings held on 01/12/2022 and 09/12/2022 are annexed as **Annexure 5 & Annexure 6.**

Subsequent to the Joint Committee meeting on 9.12.2022, Kerala State Pollution Control Board also collected samples from 14 tube wells, waste samples from the old iron oxide pond, new iron oxide pond, ETP Pond area located within M/s. KMML. The locations detail of the tube well samples is given in **Table 10** and analysis results of the tube well samples collected on 9.12.2022 detailed in **Table 11.**

Table 10. Location details of the tube well samples inside M/s KMML collected on 9.12.2022

SL.NO.	SAMPLE ID	LOCATION	LATITUDE	LONGITUDE
1	KLM KW1	Near PSP Canteen	8.9958171	76.5311603
2	KLM KW2	Near Central store(right side)	9.0022353	76.5307499
3	KLM KW3	North side of KMML Employees co-operative society	9.002393	76.536141
4	KLM KW4	Near Civil Building	9.0020000	76.534424
5	KLM KW5	South side of LPG,near NH	8.9979492	76.5325786
6	KLM KW7	Right side of Water Treatment Plant	9.000892	76.531338
7	KLM KW8	Near boiler plant	9.001637	76.531758
8	KLM KW9	PPP area workshop(right side)	8.9991211	76.5310168
9	KLM KW11	Opposite to KMML parking area	9.000303	76.535438
10	KLM KW12	KMML guest house	8.996231	76.533472
11	KLM KW13	Ponnumvila Thahasildar office , Idappallikkotta	9.011124	76.532256
12	KLM KW14	Outside of KMML(near NH road working area)	9.009141	76.532201
13	KLM KW15	Near fire station	9.006237	76.537187
14	KLM KW16	South side of unit 400	8.9972399	76.5330382

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Table 11. Analysis results of the tube well samples collected inside M/s KMML on 9.12.2022

Sl. No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
1	KLMKW1	Near PSP Canteen	pH	-	6.40	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	BDL	1.0
			Conductivity	µS	153.00	Nil
			Alkalinity	mg/L	50.00	200
			Total Hardness as CaCO3	mg/L	29.00	200
			Calcium Hardness	mg/L	0.10	-
			Magnesium Hardness	mg/L	28.90	-
			Sulphate	mg/L	0.84	200
			Fluoride	mg/L	0.22	1
			Total Dissolved Solids	mg/L	96.00	500
			Nitrate	mg/L	4.98	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	11.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.77	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5

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Sl. No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
2	KLMKW2	Near Central store(right side)	pH	-	5.70	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	0.20	1.0
			Conductivity	µS	122.00	Nil
			Alkalinity	mg/L	54.00	200
			Total Hardness as CaCO3	mg/L	32.00	200
			Calcium Hardness	mg/L	6.00	-
			Magnesium Hardness	mg/L	26.00	-
			Sulphate	mg/L	2.25	200
			Fluoride	mg/L	0.211	1
			Total Dissolved Solids	mg/L	93.00	500
			Nitrate	mg/L	2.51	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	10.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	B DL	0.05
			Iron	mg/L	0.81	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil

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Sl No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Titanium	mg/L	BDL	Nil
3	KLMKW3	North side of KMML Employees co-operative society	pH	-	6.60	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	2.50	1.0
			Conductivity	µS	168.00	Nil
			Alkalinity	mg/L	68.00	200
			Total Hardness as CaCO3	mg/L	51.00	200
			Calcium Hardness	mg/L	17.00	-
			Magnesium Hardness	mg/L	34.00	-
			Sulphate	mg/L	3.09	200
			Fluoride	mg/L	0.306	1
			Total Dissolved Solids	mg/L	106.00	500
			Nitrate	mg/L	3.07	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	10.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	1.50	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
4	KLMKW4	Near Civil	pH	-	7.00	6.5-8.5
			Colour	CU	20.00	5

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Sl. No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
		Building	Turbidity	NTU	16.50	1.0
			Conductivity	µS	244.00	Nil
			Alkalinity	mg/L	72.00	200
			Total Hardness as CaCO3	mg/L	100.00	200
			Calcium Hardness	mg/L	61.00	-
			Magnesium Hardness	mg/L	39.00	-
			Sulphate	mg/L	3.23	200
			Fluoride	mg/L	0.231	1
			Total Dissolved Solids	mg/L	163.00	500
			Nitrate	mg/L	3.30	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	12.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	5.50	0.3
			Manganese	mg/L	0.12	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
5	KLMKW5	South side of LPG,near NH	pH	-	7.60	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	BDL	1.0
			Conductivity	µS	447.00	Nil
			Alkalinity	mg/L	72.00	200

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Sl. No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Total Hardness as CaCO3	mg/L	152.00	200
			Calcium Hardness	mg/L	29.00	-
			Magnesium Hardness	mg/L	123.00	-
			Sulphate	mg/L	1.54	200
			Fluoride	mg/L	0.689	1
			Total Dissolved Solids	mg/L	370.00	500
			Nitrate	mg/L	62.50	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	13.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.93	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	B DL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
6	KLMKW7	Right side of Water treatment plant	pH	-	7.40	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	BDL	1.0
			Conductivity	µS	196.00	Nil
			Alkalinity	mg/L	62.00	200
			Total Hardness as CaCO3	mg/L	44.00	200
			Calcium Hardness	mg/L	16.00	-
			Magnesium	mg/L	28.00	-

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Sl. No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Hardness			
			Sulphate	mg/L	1.96	200
			Fluoride	mg/L	0.276	1
			Total Dissolved Solids	mg/L	133.00	500
			Nitrate	mg/L	0.51	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	12.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.82	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
7	KLMKW8	Near boiler plant	pH	-	6.20	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	1.00	1.0
			Conductivity	µS	134.00	Nil
			Alkalinity	mg/L	52.00	200
			Total Hardness as $CaCO_3$	mg/L	43.00	200
			Calcium Hardness	mg/L	15.00	-
			Magnesium Hardness	mg/L	28.00	-
			Sulphate	mg/L	2.53	200
			Fluoride	mg/L	0.251	1
			Total Dissolved Solids	mg/L	97.00	500

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Sl. No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Nitrate	mg/L	5.43	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	15.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.95	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
8	KLMKW9	PPP area workshop (right side)	pH	-	7.50	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	2.00	1.0
			Conductivity	µS	730.00	Nil
			Alkalinity	mg/L	98.00	200
			Total Hardness as CaCO3	mg/L	278.00	200
			Calcium Hardness	mg/L	84.00	-
			Magnesium Hardness	mg/L	194.00	-
			Sulphate	mg/L	2.25	200
			Fluoride	mg/L	0.479	1
			Total Dissolved Solids	mg/L	487.00	500
			Nitrate	mg/L	18.63	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	15.90	250

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Sl. No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	1.10	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
9	KLMKW11	Opposite to KMML parking area	pH	-	6.10	6.5-8.5
			Colour	CU	5.00	5
			Turbidity	NTU	1.00	1.0
			Conductivity	µS	159.00	Nil
			Alkalinity	mg/L	44.00	200
			Total Hardness as CaCO3	mg/L	31.00	200
			Calcium Hardness	mg/L	23.00	-
			Magnesium Hardness	mg/L	8.00	-
			Sulphate	mg/L	1.83	200
			Fluoride	mg/L	0.196	1
			Total Dissolved Solids	mg/L	140.00	500
			Nitrate	mg/L	17.79	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	10.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.86	0.3

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Sl. No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	0.27	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
10	KLMKW12	KMML guest house	pH	-	6.60	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	BDL	1.0
			Conductivity	µS	258.00	Nil
			Alkalinity	mg/L	100.00	200
			Total Hardness as CaCO3	mg/L	85.00	200
			Calcium Hardness	mg/L	21.00	-
			Magnesium Hardness	mg/L	64.00	-
			Sulphate	mg/L	5.20	200
			Fluoride	mg/L	0.312	1
			Total Dissolved Solids	mg/L	161.00	500
			Nitrate	mg/L	7.71	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	7.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.43	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5

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Sl. No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
11	KLMKW13	Ponnumvila Thahasildar office, Idappallikkotta	pH	-	7.20	6.5-8.5
			Colour	CU	20.00	5
			Turbidity	NTU	0.80	1.0
			Conductivity	µS	184.00	Nil
			Alkalinity	mg/L	42.00	200
			Total Hardness as CaCO3	mg/L	26.00	200
			Calcium Hardness	mg/L	19.00	-
			Magnesium Hardness	mg/L	7.00	-
			Sulphate	mg/L	7.20	200
			Fluoride	mg/L	0.27	1
			Total Dissolved Solids	mg/L	154.00	500
			Nitrate	mg/L	21.66	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	6.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.10	0.3
			Manganese	mg/L	0.22	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
12	KLMKW1	Outside	pH		7.00	6.5-8.5

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Sl . No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
	4	of KMML(near NH road working area)	Colour	CU	10.00	5
			Turbidity	NTU	0.70	1.0
			Conductivity	µS	146.00	Nil
			Alkalinity	mg/L	20.00	200
			Total Hardness as CaCO3	mg/L	39.00	200
			Calcium Hardness	mg/L	18.00	-
			Magnesium Hardness	mg/L	21.00	-
			Sulphate	mg/L	5.30	200
			Fluoride	mg/L	0.234	1
			Total Dissolved Solids	mg/L	104.00	500
			Nitrate	mg/L	12.50	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	12.00	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.14	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
13	KLMKW15	Near fire station	pH	-	6.80	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	0.80	1.0
			Conductivity	µS	199.00	Nil
			Alkalinity	mg/L	80.00	200

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Sl. No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Total Hardness as CaCO3	mg/L	63.00	200
			Calcium Hardness	mg/L	41.00	-
			Magnesium Hardness	mg/L	22.00	-
			Sulphate	mg/L	5.62	200
			Fluoride	mg/L	0.326	1
			Total Dissolved Solids	mg/L	150.00	500
			Nitrate	mg/L	12.56	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	7.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	0.66	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil
14	KLMKW16	South side of unit 400	pH	-	6.20	6.5-8.5
			Colour	CU	10.00	5
			Turbidity	NTU	0.70	1.0
			Conductivity	µS	168.00	Nil
			Alkalinity	mg/L	52.00	200
			Total Hardness as CaCO3	mg/L	57.00	200
			Calcium Hardness	mg/L	35.00	-
			Magnesium	mg/L	22.00	-

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Sl. No	Sample code	Sample Location	Parameters	Unit	Observed Values	Acceptable limits as per BIS Drinking Water Specifications IS:10500-2012
			Hardness			
			Sulphate	mg/L	4.40	200
			Fluoride	mg/L	0.249	1
			Total Dissolved Solids	mg/L	115.00	500
			Nitrate	mg/L	6.30	45
			Residual Chlorine	mg/L	BDL	0.2 mg/L
			Chloride	mg/L	19.90	250
			Copper	mg/L	BDL	0.05
			Cadmium	mg/L	BDL	0.003
			Total Chromium	mg/L	BDL	0.05
			Iron	mg/L	2.40	0.3
			Manganese	mg/L	BDL	0.1
			Nickel	mg/L	BDL	0.02
			Lead	mg/L	BDL	0.01
			Zinc	mg/L	BDL	5
			Arsenic	mg/L	BDL	0.01
			Vanadium	mg/L	BDL	Nil
			Titanium	mg/L	BDL	Nil

The analysis results of the 14 tube well samples reveal that the pH of the tube well water samples were within a range of 5.7-7.6 and iron content is present in all the samples in the ranges of 0.1 mg/L to 5.5 mg/L and exceeding the prescribed limits of BIS Drinking Water Specification (IS 10500:2012) except at two locations (i.e., KLMKW 13 & KLMKW 14). Manganese is present in two tube well water samples (i.e., KLMKW4 & KLMKW 13) whereas Lead (0.27 mg/L) is present in one of the sample of ground water (i.e., KLMKW 11) and exceeding the prescribed limit of BIS Drinking Water Specification (IS 10500:2012).

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As per M/s. KMML, the depth of ground water in the tube well located within industry premises is around 250- 300 feet below ground level and probably this could be the reason, all the tube well water do not show much contamination.

The analysis results of sludge samples from new and old iron oxide ponds as well as ETP sludge sample collected on 9.12.2022 is given in the **Table 12** below.

Table 12. The analysis results of sludge samples collected from new and old iron oxide ponds as well as ETP sludge collected on 9.12.2022

Sl. No	Sample code	Sample Location	Parameter	Observed Values (in mg/kg except pH)
1	KLMKE1	Old Iron Oxide Pond	pH	10.0
			Copper	BDL
			Cadmium	BDL
			Total Chromium	453.87
			Iron	123532.3
			Manganese	2289.09
			Nickel	BDL
			Lead	BDL
			Zinc	BDL
			Arsenic	BDL
			Titanium	670.94
			Vanadium	513.07
2	KLMKE2	ETP Pond	pH	6.0
			Copper	BDL
			Cadmium	BDL
			Total Chromium	399.31
			Iron	24757.4
			Manganese	379.34
			Nickel	BDL
			Lead	BDL

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Sl. No	Sample code	Sample Location	Parameter	Observed Values (in mg/kg except pH)
			Zinc	BDL
			Arsenic	BDL
			Titanium	4312.58
			Vanadium	339.41
3	KLMKE3	New Iron Oxide Pond	pH	1.0
			Copper	BDL
			Cadmium	BDL
			Total Chromium	285.29
			Iron	134084.58
			Manganese	1658.22
			Nickel	BDL
			Lead	BDL
			Zinc	463.59
			Arsenic	BDL
			Titanium	909.35
			Vanadium	499.25

The analysis results of the sludge samples of old iron oxide pond, new iron oxide pond and ETP pond reveal that the parameters such as Copper, Cadmium, Nickel, Lead, Arsenic are observed as 'Below Detection Limit' and parameters such as Iron, Manganese, Total Chromium, Titanium and Vanadium are present in all three sludge samples collected on 9.12.2022. Zinc is also present in the sludge sample of new iron oxide pond.

The analysis results also reveal that pH value of sludge from new iron Oxide pond observed as 1 which is highly acidic and falls under the hazardous waste category and requires pre-treatment for disposal into secured landfill in accordance with the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016 as amended, whereas the pH value of ETP sludge and sludge from old iron oxide pond observed as 6 and 10 respectively.

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4. Status on Implementation of Time Bound Acton Plans as submitted by M/s.KMML

A petition was filed by Sri. Joy Kaitharnath against M/s KMML regarding the pollution issues of the industry (O.A 142/2013, 290/2013 and 453/2013 in Hon'ble NGT southern zone). Hon'ble NGT vide order dated 31/08/2017 had directed M/s. Kerala Minerals and Metals Limited (KMML), to prepare short term and long term measures through competent and expert developers/contractors and such processes should be completed within the time frame. Hon'ble NGT vide order dated 31/08/2017 also directed the industry to prepare an appropriate scientific scheme through Expert/Contractor with specific timeframe for soil remediation and ground water remediation and also to supply adequate potable water to the people residing in and around its industrial premises.

Hon'ble Tribunal vide order dated 31/08/2017 had directed the industry "*to deposit a sum of Rs. 1,00,00,000/- (Rupees One Crore Only) under "Polluter Pays Principle" in favour of Chairman, Kerala State Pollution Control Board" who shall keep the said amount in separate account named as "Environmental Relief Fund for remediation of Chavara Region due to pollution caused by Kerala Minerals and Metals Limited (KMML). The said amount shall be managed by the Chief Secretary, Government of Kerala and Chairman, Kerala State Pollution Control Board jointly and shall be utilised for remediation and/or for distribution to the affected persons either as per the direction of this Tribunal or as per the decision of the State Government.*"

The Kerala State Pollution Control Board is also directed to monitor the implementation of the scheme and also directions issued by this Tribunal to be carried out by the unit and if there is any violation found, they are directed to take

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appropriate action against the unit including imposition of environmental compensation for the damage caused to the environment, if any, due to further non-compliance of directions issued by the Tribunal. The status on time bound action plan submitted by M/s. KMML is detailed in subsequent paras.

4.1. Short Term Measures

Item	Work status	Target	Remarks	Remarks of the Joint Committee
Construction of Garland drain around the iron oxide (IOP)/ETP ponds	After open e-tendering work order for the Construction of Garland drain around new ETP/IOP and old ETP/IOP was issued to M/s Ravi Kumar & M/s Biohomes on 08/10/2019 and 08/04/2021 respectively. The period of contract was extended due to events viz. adverse climatic condition, restriction imposed as part of pandemic COVID19 lock down, local labour issues, ETP sludge shifting process etc. The works are now progressing at site.	Jan 2023 (NEW ETP) Mar 2023 (OLD ETP/IOP)	About 75% of garland drain Constructio n around New ETP and 40% around old ETP/IOP has been completed.	The runoff through proposed garland drain construction around the existing iron oxide pond need to be connected to the suitable treatment system to avoid acid bearing surface runoff into the nearby low lying areas or human habitation. The other option is that the entire existing iron oxide dump yard should be covered with suitable liner (s) temporarily till zero waste policy is adopted, to avoid contaminated run off. If no solution is found by the industry, entire iron oxide sludge dump yards to be capped permanently in line with the guidelines issued by CPCB or disposed off through a TSDF located in Kerala in accordance with the Hazardous and Other Waste (Management &

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Item	Work status	Target	Remarks	Remarks of the Joint Committee
				Transboundary Movement) Rules, 2016 as amended
Remediation of affected land near KMML Premises	E-Tender was invited for the Test patch for remediation of contaminated area inside KMML Premises and its consultancy works on 09/07/2019. No parties quoted. Action for limited tender for consultancy work taken on 07/08/2019. Two parties quoted the tender. Work order was issued to M/s FEDO on 05/12/2019 for consultancy and supervision of the test patch area for contaminated land in KMML premises. M/s FEDO have submitted a detailed project report with schematic drawing and lay out of the contaminated land remediation work. Tendering for test patch done in three occasions ie, 25/02/2020 (only single offer received),	Time Frame set is one year for test patch (March 2023)	Land preparation for the test patch unit completed and tendering activities for the remediation of the test patch area is in progress.	The remediation of surrounding area is not an easy task and industry should come out with the alternate options for utilization of generated process sludge, in a time bound manner. Industry should assess the contaminated areas through an institute of repute and remedial measures to be taken in accordance with the Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 as amended

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Item	Work status	Target	Remarks	Remarks of the Joint Committee
	24/06/2020 & 19/08/2020 (no party quoted). Due to non receipt of offers, action for doing the activity on trial basis has been initiated by inviting open e-tender. Accordingly land preparatory works for the test patch area completed and tendering activities for the remediation of the test patch area is in progress.			
Solid waste management in KMML (In situ/Ex-situ storage) - Geo tube as a trial implementation	Considering the constraint for shifting the entire quantity of sludge to newly proposed containment system and limitation of vacant land availability, another technological option was identified by KMML through US based Titanium technology consultant. The new technology involves dewatering	Time set is one year after getting approval from CPCB/KSPCB and subsequent ordering	Stage- 1 of this work can be completed in a period of 8-10 months, upon receipt of requisite approvals	Need approval from KSPCB and CPCB for adopting geotube technology. Hence, this method may be reviewed as the ultimate safe disposal of waste is required and the unit may explore to adopt alternate technology so as to convert iron oxide sludge into useful products.

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Item	Work status	Target	Remarks	Remarks of the Joint Committee
	and storage of solid waste using GEOTUBES which was presented to KSPCB in the meeting held on 10/12/2018. In principle approval was received and directed to submit details of the proposal. Tendering action for the Geotube iron oxide containment from new elevated iron oxide pond was done, received two offers & the same got placed before Board of Directors meeting for approval. Subsequently, Geotube suppliers had intimated KMML to get environmental clearance to submit offer for the tender. KMML submitted a request letter to KSPCB on 23/02/2022 for Environmental clearance approval to go ahead with the collection and			

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Item	Work status	Target	Remarks	Remarks of the Joint Committee
	containment of Iron oxide slurry in Geotube from the elevated new iron oxide pond as trial phase activity. Dewatered Iron oxide solids can safely be transferred to offsite after the containment. A presentation of solid waste management using Geotubes was conducted at the chamber of Chairman, KSPCB on 16/05/2022 and 14/10/2022. KMML officials visited CPCB, New Delhi on 28/11/2022 and handed over the request letter for obtaining authorization for conducting trial geotube filling and containment of iron oxide from new elevated iron oxide pond. Work can be started only with the technical concurrence of CPCB/KSPCB			

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4.2. Long Term Measures

Item	Work status	Target	Remarks	Remarks of the Joint Committee
Acid Regeneration plant (ARP) technology modification to generate saleable iron oxide	Tender was invited and opened in September 2019 & only one party quoted. Tender was closed on December 2019 and after evaluation of the proposal, the file was put up to the Board for approval. 243rd Board meeting of the company held on 21/05/2020 had accorded approval for seeking final Government sanction. The file was put up to the Government on 01/06/2020, for getting final sanction. However as per the direction given by Government of Kerala, retendering done on June 2021. Global Tender was invited from technology providers for the process modification of existing Acid Regeneration plant on 10/06/2019. The offer submitted by M/s INDROX GLOBAL PVT. LTD. Is evaluated, approved in the 250th Board of meeting held on 15/01/2022 and submitted for Government approval. A meeting was convened under the chairmanship of	18 months from order	Awaiting Government approval	Technology modification shall be implemented soon to result in toxic constituent and acidic free iron oxide sludge generation and to facilitate converting to saleable products.

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Item	Work status	Target	Remarks	Remarks of the Joint Committee
	Hon'ble Minister for Industries, Law & coir on 09/06/2022 and in the meeting, it was decided to work out the price reasonableness & submit report to Government of Kerala. Accordingly, FEDO had done the cost analysis study & the report got submitted to Government for approval to place order.			
Value addition of by products (Iron oxide/ETP sludge)	KMML identified M/s Renuka Equipments Pvt. LTD, Nagpur, with the help of M/s NEERI as the competent technology provider for the management of iron oxide stored in the old pond, by converting the same in to usable product. 234th Board meeting held on 04/04/2018 had given permission in principle for receiving a detailed techno-commercial offer for setting up a pilot plant from M/s REPL. We have received offer from M/s REPL and evaluated. It is noticed that the proposed technology is not field proven one and also involves investment around Rs.400 Crores on commercial scale set up. In order to select potential agencies to carry out value	18-24 months from the date of order/statut ory clearance.	Board approval obtained, awaiting Govt, approval for final agreement.	Necessary approval from Kerala State Pollution Control Board and CPCB shall be obtained for trial run as per Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 as amended as well as adopting the technology and it is the most recommended method for disposing the existing iron oxide sludge.

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Item	Work status	Target	Remarks	Remarks of the Joint Committee
	addition of iron oxide & ETP sludge on a total responsibility basis with suitable technology, we have published a global expression of Interest and the last date to offer was 15/03/2022. Offers are received from parties and CSIR-NIIST, TVM was appointed as consultant to carry the technical evaluation of the proposal and they have submitted their study report. Tender was invited, Board approval obtained for awarding order to the selected parties obtained, awaiting Govt approval for final agreement.			R&D team shall come up with more and more feasible technologies in this field.

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4.3. Other Initiatives of M/s. KMML

Item	Action	Target	Remarks	Remarks of Joint Committee
Iron Oxide residue sales	KMML invited e-tender for the sales of iron oxide residue for further process/value addition at end user on 19/12/2019. M/s Miracle sands and Chemicals, Tuticorin quoted for the tender and sales order was issued to the party on 09/06/2020, for shifting 10,000 MT to the end user end. Sales order of iron oxide sludge was extended for obtaining statutory approvals from TNPCB and KSPCB. M/s Miracle sands and chemicals, Tuticorin has already submitted a detailed project proposal for manufacturing Iron oxide concrete bricks along with the consent order from TNPCB valid up to March 2025 and the sale order of Iron oxide residue (10,000 MT) issued by KMML on 09/06/2020. In the meeting held on 19/09/2022 in KSPCB, Head Office, TVM, KMML requested KSPCB sanction to shift 10,000	18-24 months from the date of statutory clearance	CPCB concurrence to transfer trial quantity is in progress.	Necessary approval from Kerala State Pollution Control Board shall be obtained in accordance with the Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 as amended

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Item	Action	Target	Remarks	Remarks of Joint Committee
	MT of iron oxide to carry out trial runs as per Hazardous and Other Waste (Management and Transboundary Movement) Rules 2016 chapter II, Section No.9, Sub division 2. KSPCB informed KMML that a letter has forwarded to CPCB on 24/09/2022 for seeking their advice on conducting a trial. KMML officials visited CPCB on 28/11/2022 and made follow up for obtaining authorization for trial production of Iron oxide bricks by M/s Miracle Sands and Chemicals, Tuticorin. CPCB officials informed that authorization request from KMML will be included in the next committee meeting held in January 2023.			
ETP sludge sales	E-tender was invited by KMML for shifting 10,000 MT of ETP sludge from ETP pond on 04/02/2020 and subsequently the quantity enhanced from 10000MT to 50000 MT on	Ongoing	8658.60 MT has been shifted and balance quantity shifting is in	Progress shall be reported by M/s KMML periodically to Kerala SPCB.

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Item	Action	Target	Remarks	Remarks of Joint Committee
	17/02/2020. Sales order was issued to M/s Miracle sands and Chemicals on 09/06/2020 for 10,000 MT. A new sales order was issued to M/s Miracle sands and Chemicals for 40,000 MT on 08/04/2022.About 8658.60 MT of ETP sludge has been shifted by the party from KMML. Permission granted to M/s Miracle Sands & Chemicals from KSPCB for collection and transportation of ETP sludge from KMML valid up to 31/03/2023.		progress valid up to 31/03/2023.	
ETP Revamping/ Modernization	E tendering of ETP revamping / modernization DPR done on 10/02/2022. No offer received. Contacted parties for budgetary quote. The parties conveyed that they can proceed further only after signing an MOU. Being a public sector unit, KMML decided to go for retendering. E-tendering done for DPR preparation of ETP revamping/modernization. Three offers received and	Time frame set for draft DPR submission- DECEMBER 2022	After finalization of DPR, E-tendering will be done for ETP revamping/ modernization with necessary approvals.	Proposal for ETP upgradation as suggested by the Joint Committee need to be submitted to Kerala SPCB for approval.

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Item	Action	Target	Remarks	Remarks of Joint Committee
	work order was awarded to M/s SBA Enviro System, Delhi and draft report will be submitted within a week			
Capping of existing storage ponds	Tendering activities for capping of settling pond 1 eastern side area is under progress.	Time frame for tendering and capping Feb- 2023.	Tendering activities in progress.	Capping (as per guidelines of CPCB) Progress shall be reported periodically
Utilization of Iron oxide by making Iron sinter- value addition of iron oxide.	**In-house value addition of Iron oxide** Plant trial for a quantity 10 MT of iron oxide conducted on 23 rd Nov 2022. The trial was found successful and we were able to produce iron sinters. The sinters produced are chloride free and agglomerated, which was confirmed by outsourcing analysis at NIIST and STIC. The quality has to be confirmed by the prospective iron industry for using as raw material for iron industry.	Time frame for setting up of a plant in KMML December 2023.	We are providing samples to the different Iron industry for checking the suitability. Patent filed in 2022.	Necessary approvals from KSPCB/CPCB shall be obtained as required under the Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 as amended
Utilization of Iron oxide by making	Another plant trial for the production of DRI pellets from the iron oxide is	Time frame to be decided after the	Patent filed in 2022.	Necessary approvals from KSPCB/CPCB

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Item	Action	Target	Remarks	Remarks of Joint Committee
DRI/Sponge pellets-value addition of iron oxide.	planned. If successful, further value addition of iron oxide is possible. Trial scheduled for third week of December 2022.	trial.		shall be obtained as required under the Hazardous and Other Waste (Management & Transboundary Movement) Rules, 2016 as amended

5. Observations and Recommendations of the Joint Committee

As per observations of the Joint Committee, M/s KMML is not complying to the conditions of Integrated Consent issued under The Environment (Protection) Act 1986.

Also, *M/s KMML is still in the process of compliance to the directions issued on April 12, 2012, by CPCB under Section 5 of The Environment (Protection) Act 1986.*

Further, M/s KMML is still in the process of implementation of short term and long term measures.

Based on the appraisal of M/s. KMML on the status of implementation of the actions plans submitted earlier by M/s. KMML and additional measures are suggested for implementation in a time bound manner by M/s.KMML as detailed below :-

1. The remedial measures both short term and long term already proposed by M/s KMML shall be implemented ***within the committed time limit.***

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2. The existing effluent treatment system shall be upgraded to ensure compliance to the effluent discharge norms prescribed under the consent conditions- ***within one year.***

3. Integrated Consent to Operate issued to M/s KMML by Kerala SPCB shall be amended suitably with the necessary effluent discharge norms and hazardous waste management in accordance with the prevailing rules notified under The Environment (Protection) Rules, 1986- ***within a month.***

4. Proper sign boards should be placed at all the suitable places to avoid human/ animal contact with the polluted stagnant water bodies in the vicinity of the human habitation- ***within a month.***

5. Permanent capping of the existing storage ponds or shifting of entire hazardous waste to the CHWTSDF located nearby should be done in accordance with the Hazardous & Other Waste (Management and Transboundary Movement) Rules, 2016 as amended as well as guidelines issued by CPCB for capping of hazardous waste, if iron oxide sludge is not utilised completely.

   Till such time, the existing old iron oxide ponds should be capped temporarily using LDPE liner (s) to avoid contaminated run off flow into the nearby low lying and residential areas. Suitable chemical dosage provision to neutralise run off also be made at all the end points of drains carrying run off, within the industry premises ***before next monsoon or by May 2023.***

6. Untreated effluent generated from industry premises shall not be discharged into any drain or natural drain. Also, surface run off from old iron oxide

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ponds located within the industry premises should be stopped completely by way of constructing suitable size of a garland drain all along the industry premises and same may be connected to rainwater holding pond and excess flow to TS canal, provided free from contamination, ***within a period of nine months*** and along the periphery of old iron oxide ponds ***by March 2023***. Also, the runoff should be neutralised if required, and ensured if required suitable and proper treatment, before its discharge.

7. Among the process changes, feasibility of inclusion of wash water option for recovery of acid (which should be recycled in the process) and neutralisation of iron oxide sludge using suitable chemicals prior to the disposal of iron oxide sludge into storage tank –***within three months***.

8. Lime treatment in the existing dump yards and surface water contaminated areas as temporary measures shall be continued-***on going.***

9. Regular water supply and periodical health camps should be ensured by the company to the affected people-***on going.***

10. Existing iron oxide pond capacity is exhausted, the industry is required to take immediate action for temporary storage and its safe disposal in accordance with the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016 as amended ***with immediate effect.***

11. The R & D Options for utilisation of iron oxide sludge for recovery of iron through steel manufacturers required to be implemented within three months by obtaining requisite approvals from KSPCB and CPCB following the manifest as required under the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016 as amended, for which suitable

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conditions to be imposed and amended under the approvals granted to the industry by KSPCB. Also, M/s.KMML may explore the option of recovery of red oxide from iron oxide sludge presently being followed by M/s DCW in Tamilnadu, ***within a period of three months***.

12. Detailed assessment of affected areas in the vicinity of M/s. KMML need to be ascertained through institute of repute and option of remediation of contaminated site as well as ground water as well as feasibility of acquisition of affected land i.e., contaminated land nearby premises of M/s.KMML also be explored and implemented, ***for which time bound action plan to be submitted by M/s.KMML.***

13. M/s. KMML also ensure compliance to the CPCB directions issued under Section 5 of The Environment (Protection) Act, 1986 in April 2012, for environmentally sound management of hazardous waste in accordance with the Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016 as amended.

14. All the tube wells located within the industry premises shall be connected with tamper proof flow meter to record total water consumption of natural resources **within three months** and proper records to be maintained and submitted to Kerala SPCB on quarterly basis.

15. M/s. KMML is required to install OCEMS and also a flow meter at the effluent outlet discharge into sea to assess compliance to the effluent discharge norms prescribed under the Integrated Consent to Operate issued by Kerala SPCB under The Environment (Protection) Act, 1986. Also, OCEMS should be connected to Kerala SPCB server and also displayed at the entrance

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KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM

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Chief Environmental Engineer

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of the industry for information of general public, **within five months.**

M/s. KMML shall ensure implementation of all the action plans as per time bound action plan suggested by the Joint Committee and Kerala State Pollution Control Board shall monitor periodically.

Submitted for kind consideration of this Hon'ble National Green Tribunal.

(Suman Billa)
Principal Secretary
Industries and NORKA Department

(S.Sreekala)
Chief Environmental Engineer
KSPCB, Thiruvananthapuram

(Afsana Perween)
District Collector
Kollam

(J.Chandra Babu)
Regional Director
CPCB, Bengaluru

(Dr. John C. Mathew)
Environment Programme Manager,
Directorate of Environment and Climate Change
Representing State Wetland Authority Kerala

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM *

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Chief Environmental Engineer

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Item No.11 (Court No. 2)

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH

(By Video Conferencing)
Original Application No.502/2022

Padmakumar ...Applicant

Versus

State of Kerala ...Respondent

Date of hearing: 29.08.2022

CORAM: HON'BLE MR. JUSTICE ARUN KUMAR TYAGI, JUDICIAL MEMBER
HON'BLE DR. AFROZ AHMAD, EXPERT MEMBER

Application is registered based on a Letter Petition received by Email.

ORDER

1. Padmakumar S resident of Kochuveettil, Mullakkeri Panmana, Manayil PO, Kannathu District, Kollam, Kerala has sent the present letter petition, which is treated and registered as original application, complaining that Kerala Minerals and Metals Ltd. (KMML) Chavara in village Pamana of Kollam District of Kerala is polluting the land and water bodies for about 30 years by discharging acid water. The area surrounding the factory has become unfit for any purpose. 15 families are residing close to the acid collecting tank of company. The villagers were forced to close drinking water wells which were filled with acid. Cultivation is also not possible in the area. Lots of coconut trees fell due to corroded land. The industry is pumping acid waste directly to sea and connected lake through canals. Vattakkayal, a part of Ashtmudi, Vembanad lake in Perookkara is now filled with the acid clay waste polluting the environment and endangering life of the villagers.

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Chief Environmental Engineer

SREEKALA S.
Chief Environmental Engineer

2. This Tribunal is empowered to *suo moto* take cognizance of the cases involving questions relating to environment arising out of the implementation of enactments specified in First Schedule of the National Green Tribunal Act, 2010 as held by Hon'ble Supreme Court in ***Municipal Corporation of Greater Mumbai V/s. Ankita Sinha and others 2021 SSC Online SC 897.*** This Tribunal can also take cognizance of such cases on the basis of letter petitions in accordance with settled principles of law governing Public Interest Litigation.

3. *Prima facie*, the allegations made in the application raise questions relating to environment arising out of the implementation of the enactments specified in Schedule I to the National Green Tribunal Act, 2010. In view of the allegations made in the application, we consider it appropriate that a Joint Committee be constituted to verify the factual position. Accordingly, we constitute a Joint Committee comprising of Principal Secretary (Industries & NORKA), Government of Kerala, CPCB, State PCB, State Wet Land Authority and Collector, Kollam and direct the same to meet within two weeks, undertake visits to the site, look into the grievances of the applicant, associate the applicant and representative of the concerned project proponent, verify the factual position and submit its report within one month by e-mail at judicial-ngt@gov.in preferably in the form of searchable PDF/OCR Supported PDF and not in the form of Image PDF. The State PCB will be the nodal agency for coordination and compliance.

4. In case the Joint Committee observes any violation of consent conditions/environmental norms then it shall forward a copy of its report to

(i) Project Proponent to enable it to comply with the recommendations in its report or file objections against the observations/recommendations in the report of the Joint Committee and file its response before this Tribunal as desired within one month

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from the date of receipt of a copy of the report of the Joint Committee; and

(ii) Principal Secretary (Industries & NORKA), Government of Kerala, State PCB, State Wet Land Authority and Collector, Kollam to enable them to take appropriate remedial action by giving notice to/hearing the project proponent and following due process of law in accordance with Statutory provisions mandating them to take remedial action for prevention, control and abatement of environmental pollution/degradation and protection and improvement of environment and submit their action taken report within one month from the date of receipt of a copy of the report of the Joint Committee.

5. List for further consideration on 13.12.2022.

6. A copy of this order, along with a copy of the application and documents attached with the same, be forwarded to the Principal Secretary (Industries & NORKA), Government of Kerala, CPCB, State PCB, State Wet Land Authority and Collector, Kollam by e-mail for compliance.

Arun Kumar Tyagi, JM

Dr. Afroz Ahmad, EM

August 29, 2022
AO

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM *

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE

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Chief Environmental Engineer

Item No.2 (Court No. 2)

BEFORE THE NATIONAL GREEN TRIBUNAL
PRINCIPAL BENCH, NEW DELHI

(Through Physical Hearing with Hybrid VC Option)
Original Application No.502/2022

Padmakumar ...Applicant

Versus

State of Kerala ...Respondent

Date of hearing: 13.12.2022

CORAM: HON'BLE MR. JUSTICE ARUN KUMAR TYAGI, JUDICIAL MEMBER
HON'BLE DR. AFROZ AHMAD, EXPERT MEMBER

Applicant: Mr. Arun Chand, Advocate (through VC).

Respondents: Mr. Nishe Rajen Shonker and Mr. Alim Anuar, Advocates for State of Kerala.
Mr. Keerthi Priyan. E, Advocate for Mr. Jogy Scaria, Advocate for Kerala State Pollution Control Board.

Application is registered based on a Letter Petition received by Email.

ORDER

1. Padmakumar S resident of Kochuveettil, Mullakkeri Panmana, Manayil PO, Kannathu District, Kollam, Kerala has sent the present letter petition, which is treated and registered as original application, complaining that Kerala Minerals and Metals Ltd. (KMML) Chavara in village Pamana of Kollam District of Kerala is polluting the land and water bodies for about 30 years by discharging acid water. The area surrounding the factory has become unfit for any purpose. 15 families are residing close to the acid collecting tank of company. The villagers were forced to close drinking water wells which were filled with mud. Cultivation is also not possible in the area.

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM

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Chief Environmental Engineer

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Lots of coconut trees fell due to corroded land. The industry is pumping acid waste directly to sea and connected lake through canals. Vattakkayal, a part of Ashtmudi, Vembanad lake in Perookkara is now filled with the acid clay waste polluting the environment and endangering life of the villagers.

2. Vide order dated 29.08.2022, this Tribunal constituted a Joint Committee comprising of Principal Secretary (Industries & NORKA), Government of Kerala, CPCB, State PCB, State Wet Land Authority and Collector, Kollam and directed the same to submit factual and action taken report within one month and send the copies of the report of the Joint Committee to the Project Proponent/Statutory Authorities.

3. In compliance thereof, Mr. Sreekala S, Chief Environmental Engineer has submitted report of the Joint Committee vide email dated 29.11.2022.

4. In its report, the Joint Committee has submitted that the water and sludge samples taken from the industrial unit and its premises were taken to Central Laboratory, KSPCB, Ernakulam for processing and thereafter digested samples (21 Nos) were sent to Regional Lab of Regional Directorate, CPCB, Bengaluru for further analysis. As per the decision of the Joint Committee, the final report shall be prepared and submitted before this Tribunal at the earliest after obtaining the analysis result of the samples, sludge samples and samples of stagnant water near the industry premises collected during the visit of Joint Committee on 17.10.2022.

5. The Joint Committee is directed to submit its further report by 31.01.2023 by email at judicialngt@gov.in preferably in the form of searchable PDF/OCR Supported PDF and not in the form of Image PDF.

6. In view of the averments made in the application and observations made in the report of the Joint Committee, we consider it appropriate to

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM

SREEKALA S.
Chief Environmental Engineer

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have response of (1) State of Kerala through Chief Secretary, Government of Kerala, (2) Principal Secretary, Department of Industries & NORKA, State of Kerala, (3) State PCB, (4) Member Secretary, Kerala State Wetland Authority, (5) the District Collector, Kollam, and (6) the Project Proponent M/s Kerala Minerals and Metals Ltd., who stand impleaded as respondents No. 1 to 6. The Registry is directed to prepare and attach memo of parties to the application and issue notices to respondents No. 1 to 6.

7. Notice requiring filing of reply/response within two months be served on the Project Proponent- M/s Kerala Minerals and Metals Ltd. through the District Collector, Kollam and for this purpose notice issued to the Project Proponent be sent to the District Collector, Kollam by E mail for getting service of the same effected on it and sending his report in this regard.

8. Mr. Nishe Rajen Shonker and Mr. Alim Anuar, Advocates accept notice on behalf of respondents no. 1, 2, 4 and 5 and Mr. Keerthi Priyan E, Advocate accepts notice on behalf of respondent no. 3 and they seek time to file reply/response on behalf of respondents no. 1 to 5.

9. Reply/response by respondents no. 1 to 6 be filed within two months by email at judicial-ngt@gov.in preferably in the form of searchable PDF/OCR Supported PDF and not in the form of Image PDF.

10. In view of the observations made in the report of the Joint Committee and environmental statutory enactments casting obligations on the State and its instrumentalities and State Pollution Control Board to protect and improve environment, the respondents no. 1 to 5 are also directed to take appropriate remedial measures and also file Action Taken Report alongwith their reply/response within two months as directed above.

11. List for further consideration on 06.03.2023.

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM

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12. A copy of this order be sent to the District Collector, Kollam for requisite compliance for effecting service of notice on the project proponent and sending his report to this Tribunal

Arun Kumar Tyagi, JM

Dr. Afroz Ahmad, EM

December 13, 2022
AG

KERALA STATE POLLUTION CONTROL BOARD • REGIONAL OFFICE • THIRUVANANTHAPURAM •

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Chief Environmental Engineer

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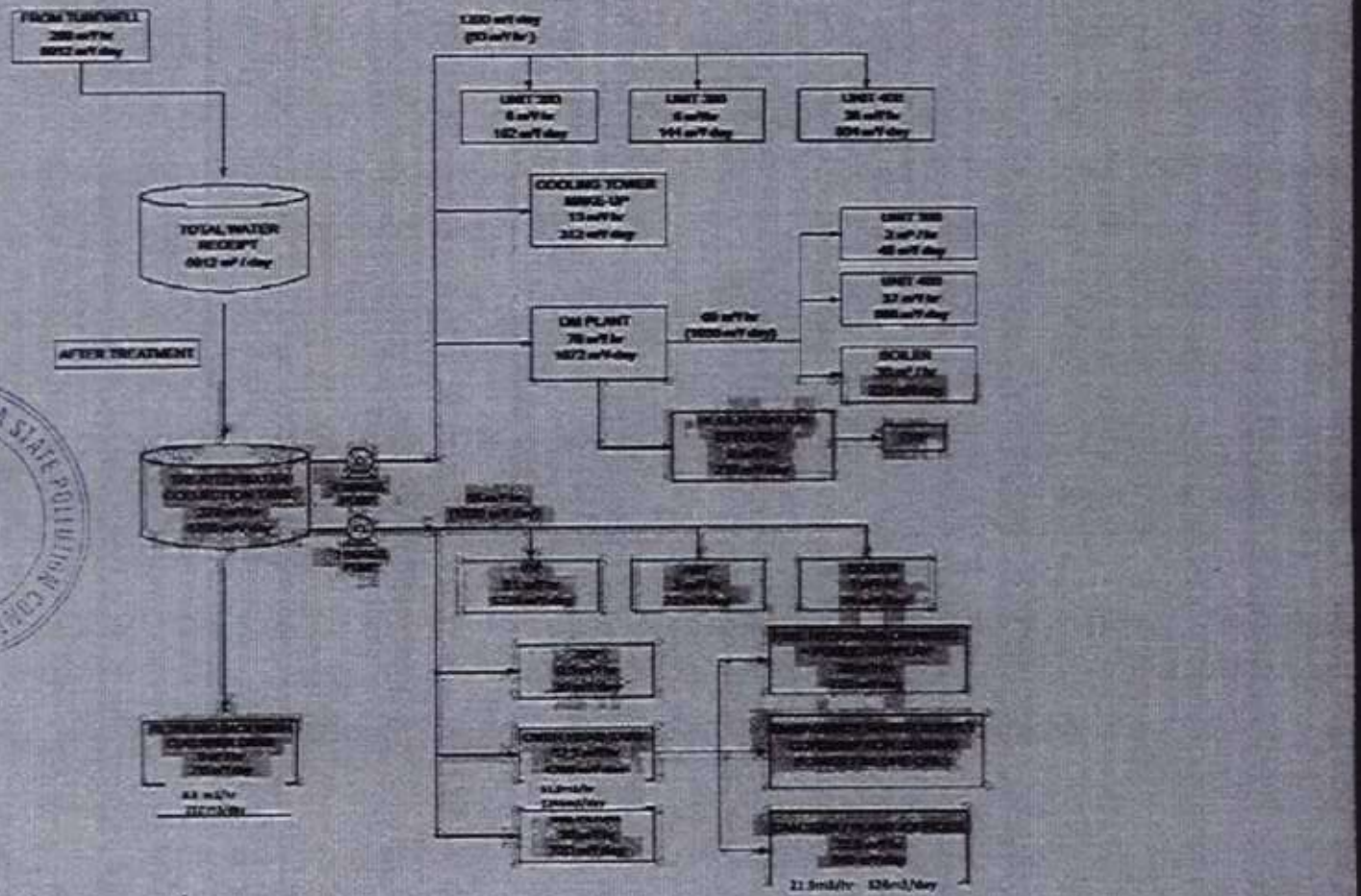
Chief Environmental Engineer

WATER CONSUMPTION DIAGRAM



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Chief Environmental Engineer

KERALA STATE POLLUTION CONTROL BOARD
REGIONAL OFFICE
THIRUVANANTHAPURAM

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Chief Environmental Engineer

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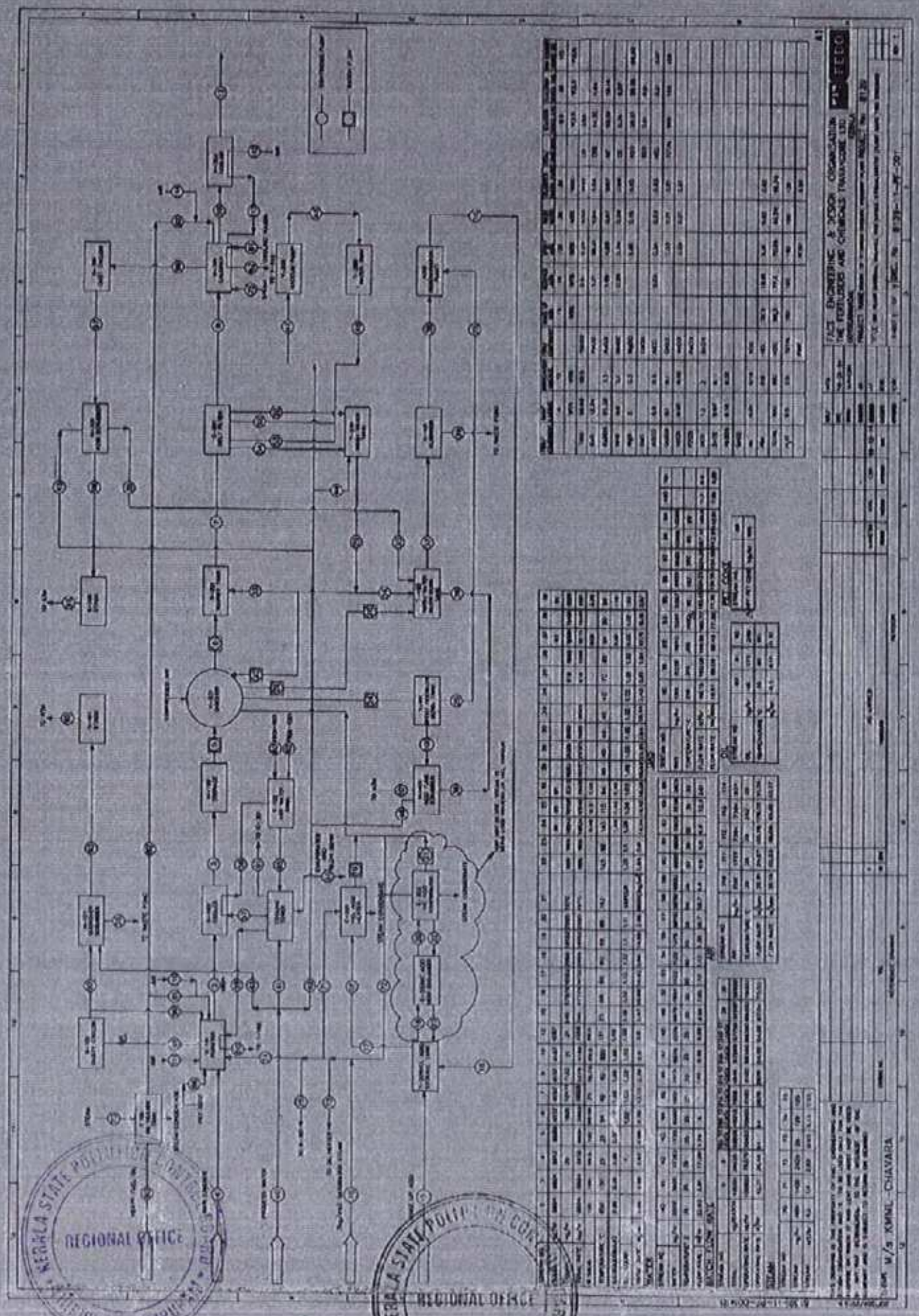
Annexure 4



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SREEKALA S.
Chief Environmental Engineer

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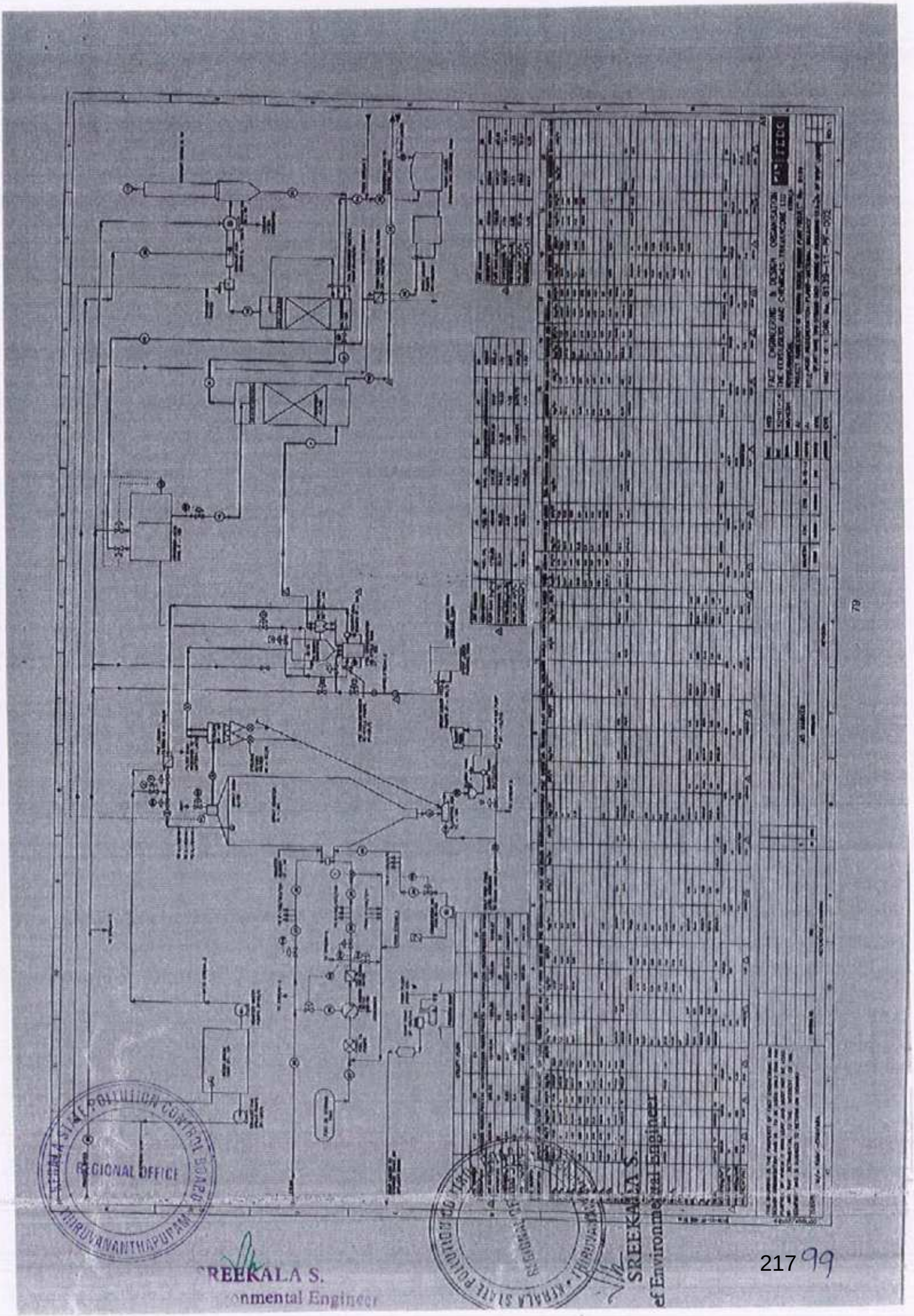
Chief Environmental Engineer



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Environmental Engineer

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Environmental Engineer

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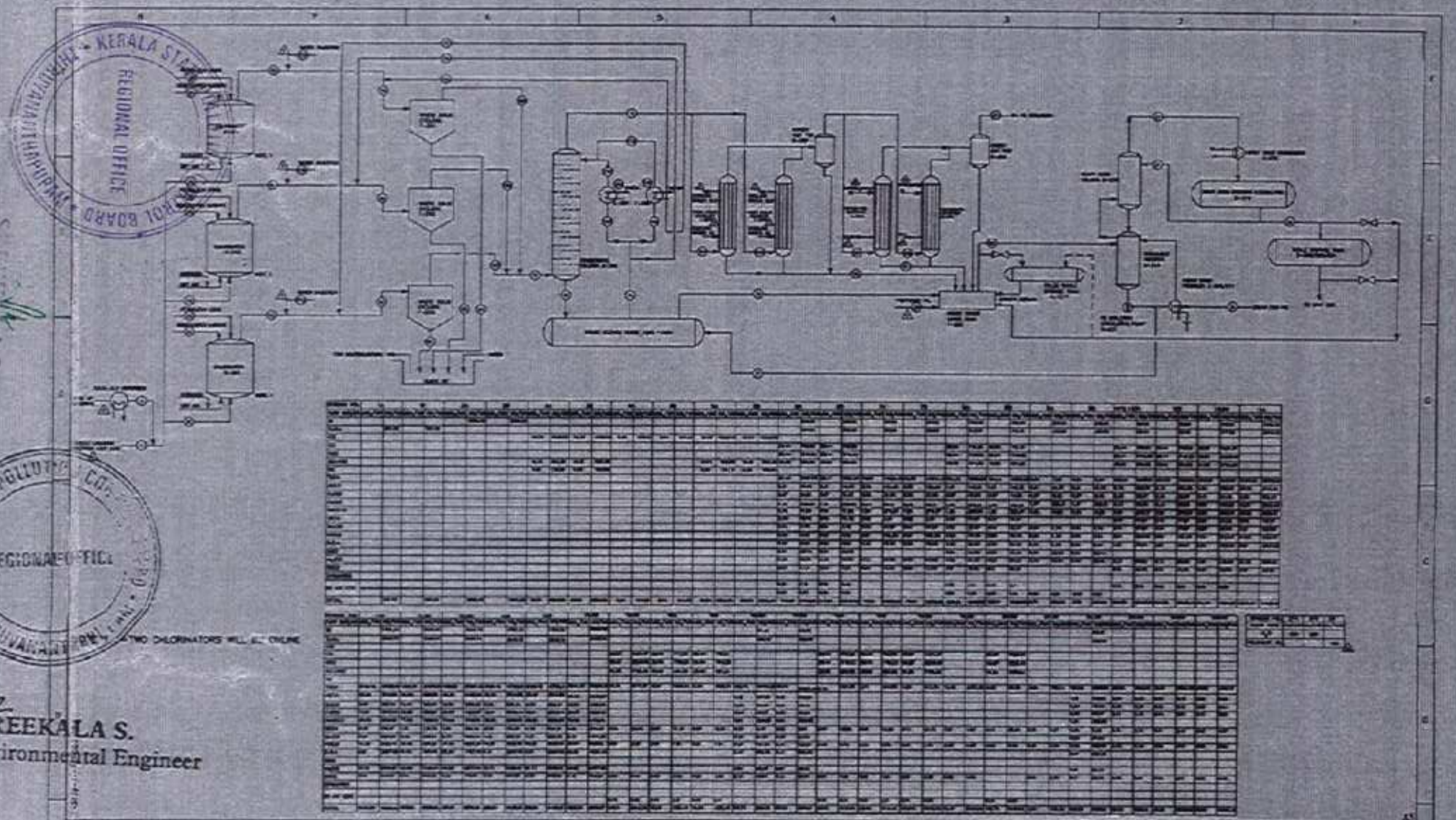

TWO CHLORINATORS WILL BE ONLINE

									SCALE	NTS
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		1		AS MARKED	MAHESH	KVK	CVR	26-12-14	CHECKED	KVK
DRAWING No.		No.	ZONE	PARTICULARS	REVISED	CHECKED	APPROVED	DATE	APPROVED	CVR
REFERENCE		REVISION								

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CLIENTS M/s KMML-CHAVARA

FACT ENGINEERING & DESIGN ORGANISATION
THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL KERALA

FEDO

PROJECT NAME STUDY OF TITANIUM OXIDE PIGMENT PLANT PROJECT No. 8139

TITLE UNIT 200 CHLORINATOR SECTION MATERIAL BALANCE (276TPD TICKLE PRODUCTION)

SHEET NO 1 OF 1 | DRG. No. 8139-11-PF-003 | REV. 2

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Chief Environmental Engineer

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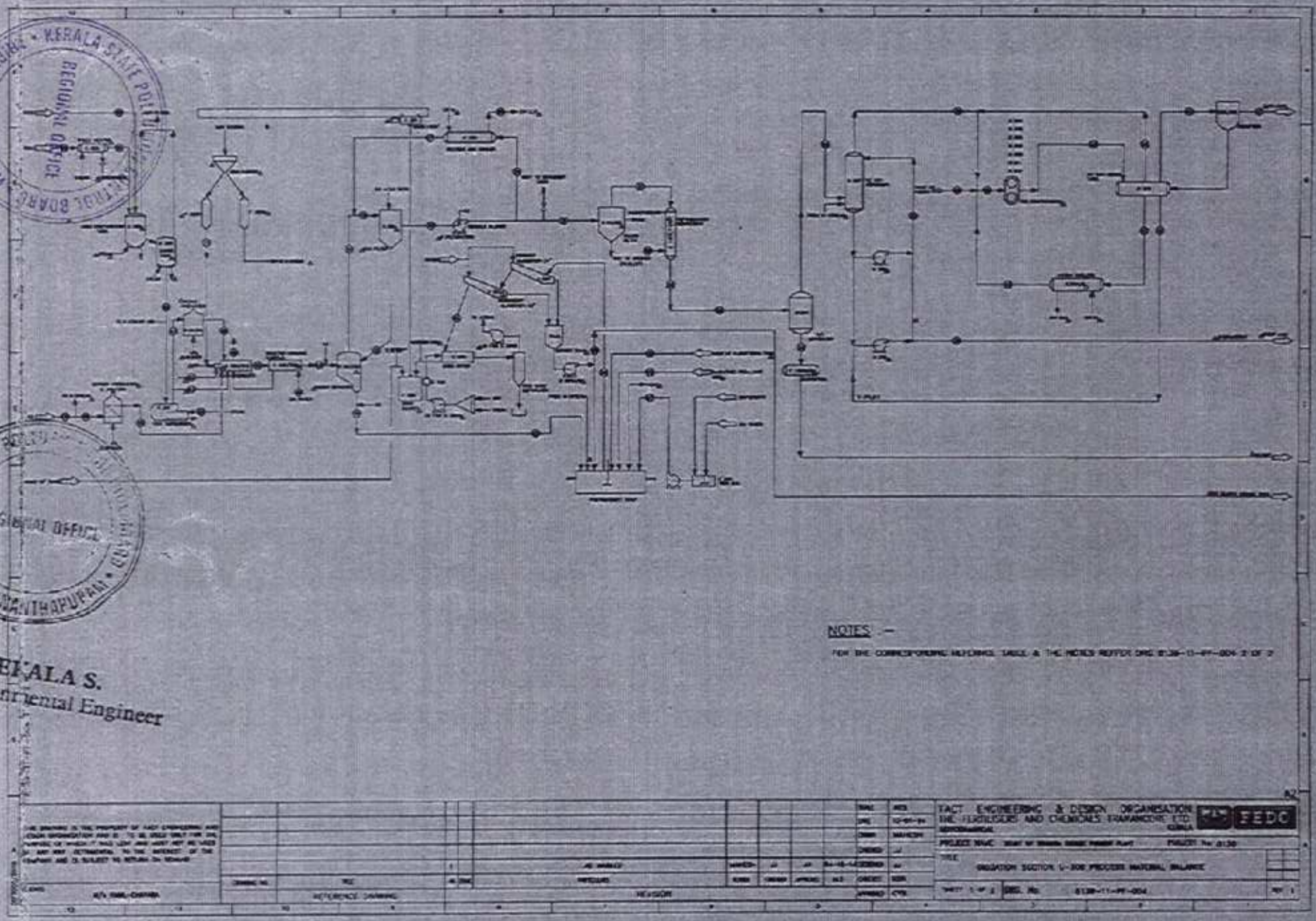

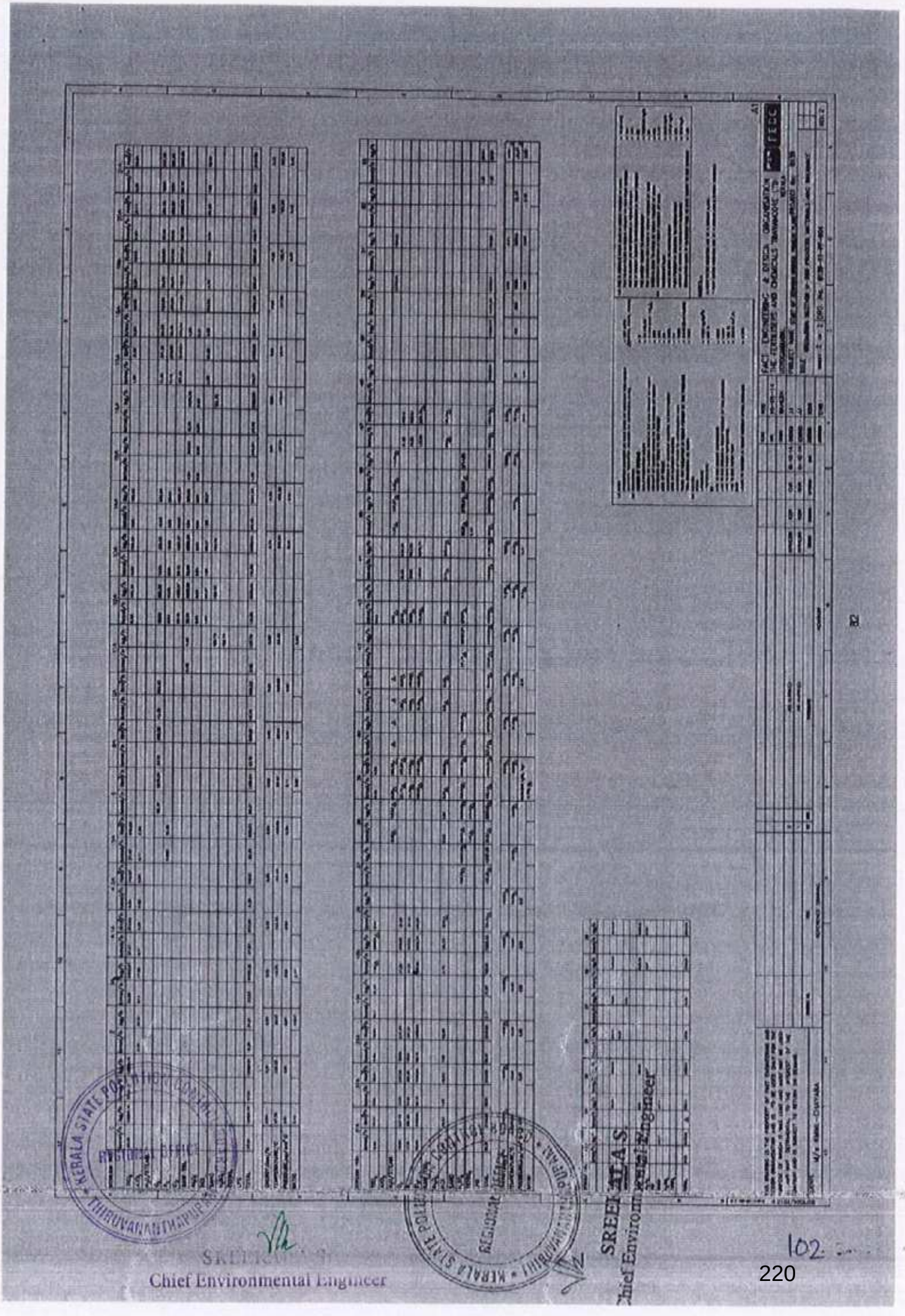

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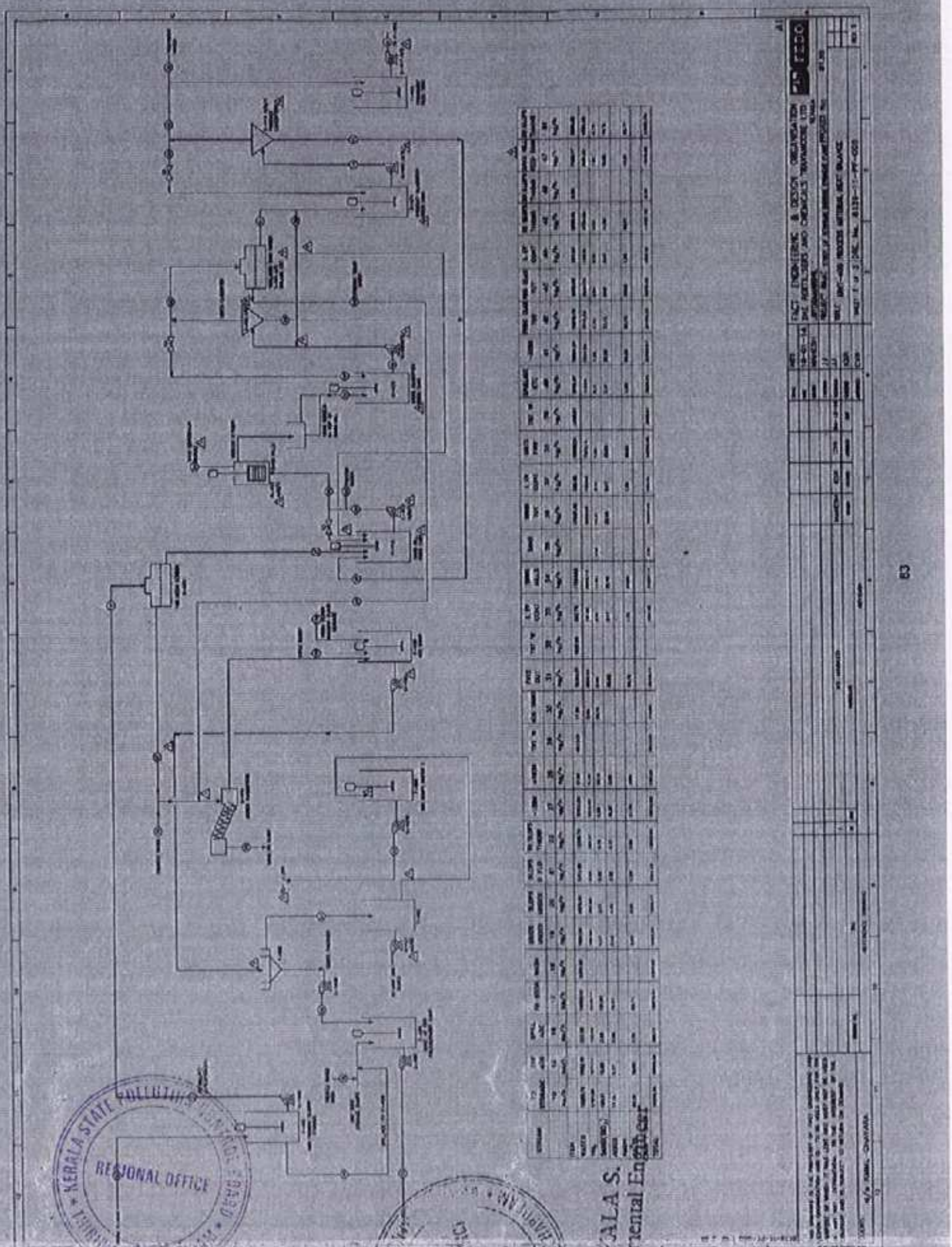
Chief Environmental Engineer



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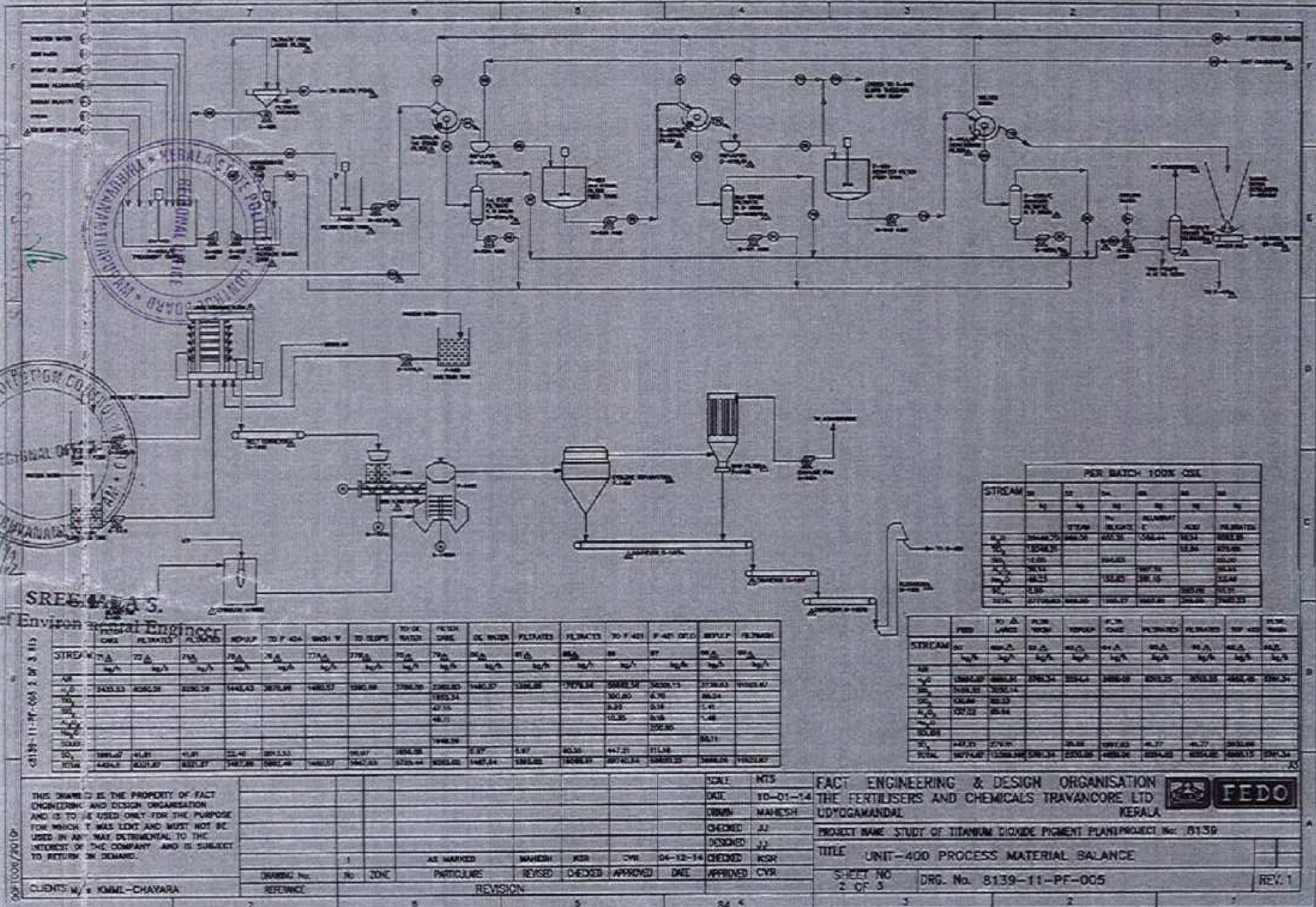
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STREAM
FACT ENGINEERING & DESIGN ORGANISATION
THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL
KERALA
FEDO
PROJECT NAME STUDY OF TITANIUM DIOXIDE PIGMENT PLANT PROJECT No: 8139
TITLE UNIT-400 PROCESS MATERIAL BALANCE
SHEET NO 2 OF 3
DRG. No. 8139-11-PF-005
REV. 1
SCALE NTS
DATE 10-01-14
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CHECKED KSR
APPROVED CVR
1 AS MARKED MAHESH KSR CVR 04-12-14
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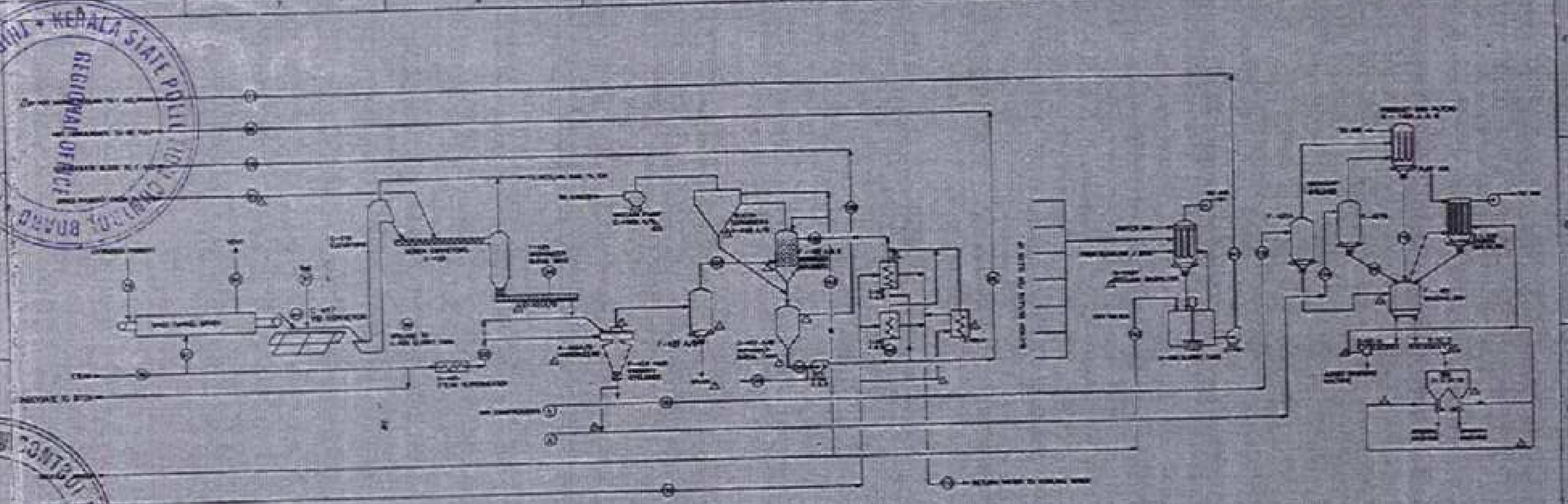
CLIENTS M/s KMML-CHAYARA
KERALA STATE POLLUTION CONTROL BOARD
REGIONAL OFFICE
THIRUVANANTHAPURAM
SREELATHA S.
Chief Environmental Engineer



STREAM	CHAL TO DRYER 79	REPULP 83	SAT STEAM 92	VENT 97	DRY PIG 94	DRY PIG 95	96	LOSSES 98	MIC FEED 99	SUPHT STM 100	MIC PG AIR 101	MIC PG AIR 101	STM TO SCR 103	TRTW 104	105	HTRC 107	COLD COND 108	BLEED 109	RECLAIM 111	TRTW 112	RECLAIM 113	SEC CYC 114	IN PACK 117	IN PACK 117
	kg/h	kg/h	[illegible]	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	Nm3	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	kg/h	%	kg/h
AIR							96927.50			14787.30	3097.00	4000.89												
STEAM			5020.64										19108.40	5594.08	317284.44	294921.54	291170.80	10514.25	4.62	257.34	257.34		1.32	38.12
[illegible]	[illegible]4.71	9372.80			102.64	171.07		4.92	288.79			4544.52	326.72		4680.43	4339.73	4377.67	161.42	88.90		88.95		152.78	4544.32
[illegible]	[illegible]	147.59			1853.34	3088.89		88.93	4633.28			115.60	7.86		118.23	115.36	121.38	4.11	2.27		2.27		3.91	115.60
[illegible]		3.75			47.35	78.07		2.27	123.48			128.41	8.18		124.21	120.31	118.02	4.29	2.38		2.36		4.08	128.41
[illegible]					48.11	81.84		2.36	128.59															
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TMC															4825.59	4774.94	4805.09	169.80	93.58		92.38	4700.33		4780.53
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SOLID		154.90																		257.34	359.92			
TOTAL	11563.11	10280.79	5020.64		2052.23	3420.38	28122.39	98.5009	5374.1	14787.30		12088.8	19543.2	5594.08	322214.33	299990.48	300175.89	11108.09	98.50					

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CLIENTS M/s KMML-CHAVARA

DRAWING No.	No.	ZONE	AS MARKED PARTICULARS	MAHESH REVISED	KSH CHECKED	CVR APPROVED	04-12-04 DATE
REFERENCE			REVISION				

SCALE	NTS
DATE	10-01-04
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CHECKED	AB
DESIGNED	AB
CHECKED	KSH
APPROVED	CVR

FACT ENGINEERING & DESIGN ORGANISATION
THE FERTILISERS AND CHEMICALS TRAVANCORE LTD
UDYOGAMANDAL KERALA

FEDO

PROJECT NAME: STUDY OF TITANIUM DIOXIDE PIGMENT PLANT PROJECT No: 8139

TITLE: UNIT-400 PROCESS MATERIAL HEAT BALANCE

SHEET NO 3 OF 3 | DRG. No. 8139-11-PF-005 | REV 1

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Annexure B

Minutes of the Joint Committee meeting (V. C.) held on 01/12/2022 in the chamber of Chief Environmental Engineer, Regional Office, Thiruvananthapuram

The Hon'ble NGT vide order in OA 502/2022 dated 29/08/2022 constituted a Joint Committee to verify the factual position with respect to Kerala Minerals and Metals Ltd (M/s KMML)., Chavara, Kollam. Accordingly a joint committee meeting on 11/10/2022 and site visit on 17/10/2022 were conducted and samples were collected from M/s KMML and its premises.

A Joint Committee meeting was convened on 01/12/2022 through VC to discuss the analysis results of the samples collected on 17.10.2022 in and around the premises of M/s. KMML, under the Chairmanship of Principal Secretary, Industries & NORKA Department, Government of Kerala. Mrs. Sreekala, The Chief Environmental Engineer, Kerala SPCB welcomed all the members and the officials to the meeting. The following members of the Joint Committee and the officers attended the meeting.

1. Sri. Suman Billa.,
   Principal Secretary, - Member
   Industries & NORKA Department.

2. Sri. J. Chandra Babu.,
   The Regional Director,
   Regional Directorate, - Member
   Central Pollution Control Board,
   Bengaluru, Karnataka- 560079.

3. Sri. Mukund Thakur I.A.S.,
   Sub Collector, Kollam. - (on behalf of District Collector)

4. Dr. John C. Mathew
   Environment Programme Manager
   Directorate of Environment and Climate Change
   Thampanoor, Thiruvananthapuram - Member
   (Representative of SWAK)

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Chief Environmental Engineer

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Chief Environmental Engineer

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5. Mrs. S. Sreekala, - Nodal Officer
   Chief Environmental Engineer,
   Kerala State Pollution Control Board
   Regional Office, Thiruvananthapuram

6. Dr. Deepesh V.
   Scientist 'C'
   Central Pollution Control Board
   Regional Directorate (South), Bengaluru.

7. Smt. Rachel Thomas
   Environmental Engineer,
   District Office, Kollam

8. Smt. Sreetha A. M.,
   Assistant Environmental Engineer,
   Regional Office, Thiruvananthapuram.

9. Smt. Asha J.S.,
   Assistant Engineer,
   Regional Office, Thiruvananthapuram.

The Chief Environmental Engineer detailed about the analysis report of the samples collected. All the **stagnant water samples** collected from the nearby premises of the industry, the canal near MS plant, TS canal and near Vattakkayal had acidic pH in the range of 2-3. The parameters such as Iron and Manganese were exceeding the limits in all these locations. Zinc exceeded in two locations and Vanadium exceeded in some of the locations. The parameters such as Oil and grease, Total residual chlorine, Copper, Cadmium, Total chromium, Nickel, Lead, Arsenic and Titanium for all the samples collected outside the industry were Below Detectable Limit (BDL). The samples from the **ETP pond (supernatant) and approved discharge point of KMML** shows neutral pH whereas the parameters such as Total Suspended Solids, Total Chromium, Iron, Manganese, Vanadium, and Titanium were exceeding the limits prescribed under the Consent issued under the Water (Prevention and Control of Pollution) Act, 1974. One of the **well water sample** shows an acidic pH of 3.1 and the

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Chief Environmental Engineer

SREEKALA S.
Chief Environmental Engineer

parameters such as Iron and Manganese are exceeding the limits prescribed for Drinking Water Specifications i.e., IS 10500:2012. The other two well water samples shows neutral pH and the value of Iron exceeding the limits prescribed for Drinking Water Specifications i.e., IS 10500:2012 and suspended solids were also present. The parameters such as Iron, Manganese, and Vanadium were present in the iron oxide sludge sample. All these parameters were exceeding the limits (as per MoEF guidelines) in the stagnant samples collected from the nearby premises. It may be inferred that there is every possibility of leakage or runoff from iron oxide sludge from the company to the nearby premises. The analysis of the stagnant water samples collected from the nearby area of the company show acidic pH and presence of heavy metals. All the three well water samples also show high concentration of iron and one sample shows acidic pH. It is understood that the nearby area is polluted and the wells are not fit for drinking purpose. The storm water sample (KLMK11) of the industry show acidic pH and presence of Iron, Manganese and Vanadium which implies that the land inside the industry is either polluted or there is a possibility of leakage / spillage of iron oxide sludge into nearby area including Vattakayal. The treated effluent sample from the industry shows total suspended solids and heavy metals above the limit specified which implies that the present treatment system is not adequate enough to comply with the effluent discharge standards and requires upgradation. The graphical representation of the analysis results were also presented during the meeting. Chief Environmental Engineer pointed out that the parameters of stagnant water is compared with MoEF guidelines with respect to surface water and the parameters of well water is compared with the drinking water specifications (I S 10500:2012)

Sri. J Chandra Babu, Regional Director CPCB Bengaluru was of the view that the analysis results of the collected effluent discharge sample reveal that the effluent discharge sample is exceeding limits permissible under the consent

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SREEKALA S.
Chief Environmental Engineer

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SREEKALA S.
Chief Environmental Engineer

norms, and also existing effluent treatment system consisting of neutralization using lime followed by settling tank, which is not adequate for removal of heavy metals and also to comply with the effluent discharge norms. Therefore, he opined that existing effluent treatment system should be upgraded to ensure compliance to the consent discharge norms. Regional Director also added that there is every chance of runoff from the existing iron oxide pond area specially during monsoon resulting pollution of nearby land. In order to avoid this, scientific approach should be followed in line with the guidelines issued by CPCB from time to time. Regional Director also pointed out that proper sign boards should be placed at all the suitable places to avoid human/ animal contact with the polluted stagnant water bodies in the vicinity of the human habitation.

Members of the Joint Committee were of the view that actual problems associated with M/s. KMML need to be identified, both short term and long term remedial measures to be suggested to comply the same in a time bound manner by M/s KMML. Therefore, Committee members suggested for seeking extension of time for filing the final report through the KSPCB advocate.

The Regional director and Principal Secretary, Government of Kerala pointed out that the basic findings of the committee regarding the matter shall be shared with the company authorities and a meeting shall be scheduled to discuss the status and to further proceed in the matter. Kerala SPCB being nodal agency in the matter, necessary information to be collected from M/s. KMML authorities and draft Joint Committee report need to be prepared and circulated to the committee members at an early date seeking comments or views for its finalization and for filing before Hon'ble NGT for consideration.

The meeting ended with vote of thanks to the Chair.

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CHIEF ENVIRONMENTAL ENGINEER

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Chief Environmental Engineer

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Minutes of the Joint Committee meeting held on 09/12/2022 at Kerala Minerals and Metals Ltd. (M/s KMML), Chavara, Kollam

The Joint Committee meeting was convened on 09/12/2022 at Kerala Minerals and Metals Ltd (M/s KMML)., Chavara, Kollam premises to ensure compliance to the Hon'ble NGT order dated 29/08/2022 passed in OA No. 502/2022. At the outset, Mrs. Sreekala, The Chief Environmental Engineer, Kerala SPCB, Nodal Officer welcomed all the members of the Joint Committee and the officials attended the meeting. The following Joint Committee members and officers attended the meeting.

Joint Committee Members:-

1. Sri. Suman Billa.,
   Principal Secretary, - Member (via V.C.)
   Industries & NORKA Department.

2. Sri. J. Chandra Babu.,
   The Regional Director,
   Regional Directorate, - Member
   Central Pollution Control Board,

3. Sri. Roy Kumar F.
   Deputy Collector LA, -- (on behalf of District Collector)
   Collectorate, Kollam

4. Dr. John C. Mathew
   Environment Programme Manager
   Directorate of Environment and Climate Change
   Thampanoor, Thiruvananthapuram - Member
   (Representative of SWAK)

5. Mrs. S. Sreekala, - Nodal Officer
   Chief Environmental Engineer,
   Kerala State Pollution Control Board
   Regional Office, Thiruvananthapuram

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Officials attended the meeting: -

6. Smt. Rachel Thomas
   Environmental Engineer, KSPCB
   District Office, Kollam

7. Smt. Sreetha A. M.,
   Assistant Environmental Engineer,
   Regional Office, KSPCB, Thiruvananthapuram.

8. Smt. Asha J.S.,
   Assistant Engineer,
   Regional Office, KSPCB, Thiruvananthapuram.

Representatives of M/s KMML

1. Sri. Chandra Bose
   Managing Director
   Kerala Minerals and Metals Limited

2. Sri. Manikkuttan P.K.
   HOU (TP/TSP)
   Kerala Minerals and Metals Limited

3. Sri. Anilkumar K. S.
   HOD (Environment)
   Kerala Minerals and Metals Limited

4. Sri. Sahil M.
   HOD (Projects)
   Kerala Minerals and Metals Limited

5. Sri. Ajesh Chandran B.C.
   Manager (Civil)
   Kerala Minerals and Metals Limited

With the concurrence of committee, Sri. Chandra Bose, Managing Director, M/s.KMML made a presentation on the status of short term and long term remedial measures as detailed below:-

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- One of the short term remedial measure is construction of garland drain around the existing old dumpsite of Iron Oxide Sludge and is reported to be completed 75% around the new ETP and same expected to be completed by January 2023 and whereas around old ETP, about 40% of work completed and expected to be completed fully before by March 2023.
- Regarding the remediation of affected land around the company premises, test patches were carried out and expected to be completed by March 2023.
- As part of waste management, Geotube technology is proposed and is waiting to get approval from State Government as well as Central Pollution Control Board.
- Proposed modification of Acid Recovery plant as long term measure is pending for approval from Government of Kerala. After the modification of this plant, the iron oxide expected to be generated free from acid content and in saleable form. Another suggestion by NEERI was the value addition of the iron oxide sludge to saleable products.
- Managing Director also added that, one German company, M/s Tetrabic, approached to construct a plant inside the M/s.KMML for converting the ETP sludge and iron oxide sludge into usable products and this project is pending for State Government Approval.
- The ETP sludge (50000 Tonnes) is being transferred to M/s. Miracle Sands and Chemicals in Tamilnadu for processing and further utilization with the approval of the Kerala State Pollution Control Board (KSPCB). As on date, about 10000 Tonnes of ETP sludge already transferred to M/s. Miracle Sands and Chemicals in Tamilnadu.
- The Managing Director also apprised the committee that the internal R & D team has developed a new technology of converting acidic iron oxide sludge into neutral metallic iron and the samples are sent to some steel

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industries and waiting for their response for utilizing as raw material. The R & D wing has also came up with additional techniques which are under trial run. The production of DRI pellets from the iron oxide was also found successful within the company.

- About 2 to 3% of their profit is presently spending towards the company's corporate social commitment. The social commitment activities by the company include welfare activities in 7 wards including the drinking water supply, sanitation and also conducting of regular medical camps etc.

The Principal Secretary enquired whether these remedial measures are adequate for mitigating the defects noticed by the committee as part of the study. The Managing Director agreed that the water samples outside the company premises are found to be acidic in nature which is mainly due to the runoff from the existing iron oxide old dump site. As a short term measure, trial for remediation of affected land is under progress and same will be implemented to remediate the land outside the company premises, upon successful results. However, he expressed that permanent solution for this issue is acquisition of 76 acres of affected land around the company. Earlier 183 acres were identified and out of that, 76 acres were most affected area and the company have active plan to acquire that land.

To the query of The Principal Secretary regarding the adequacy of the proposed remedial measures suggested by the company to mitigate the pollution issues, Mr. Manikuttan, representative of KMML replied that even though the long term and short term measures were suggested, the acquisition of affected land is the final solution for this problem. Test patch study itself cost huge amount and about 2-3 km near the company needs to be remediated and it will become a huge burden for the company. He added that once the R & D study of the

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company becomes successful the entire iron oxide sludge can be converted into value added products. The capping of the existing ponds can also be done to avoid overflow.

The Chief Environmental Engineer mentioned that there is no fruitful remedial measures put forwarded by the company to remediate the affected land near the industry. The patch test for the remediation of land and replication of it into the surrounding area will take long time.

The Regional Director, CPCB stated that some of the remedial measures by the company is as per recommendations of the expert institute of repute. The feasibility of the measures suggested by the company has to be examined in detail. Among the process change, one of the suggestions is that a wash water provision as option for recovery of acid (which should be recycled in the process) and the iron oxide sludge to be neutralized using suitable chemicals before disposal of iron oxide sludge into storage tank. The Regional Director also added that the runoff through proposed garland drain construction around the existing iron oxide pond need to be connected to the suitable treatment system to avoid acid bearing surface runoff into the nearby low lying areas or human habitation. He is of the view that better solution is that the entire existing iron oxide dump yard should be covered with suitable liners temporarily till zero waste policy is adopted. If no solution is found by the industry, entire iron oxide sludge yards to be capped permanently in line with the guidelines issued by CPCB. The Ground water monitoring has to be carried out in and all around the areas to check the contamination and for taking remedial measures if required. Also, signboards boards at all the salient points shall be placed where the contaminated stagnant water is present. Lime treatment in the existing dump yards as temporary measures shall be continued. The remediation of surrounding area is not so easy task and industry should come out with the

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alternate options for utilization of generated process sludge. The regular water supply and periodical health camps should be ensured by the company to the affected people. The R & D options to be implemented at an early date by taking requisite approvals from KSPCB and CPCB following the manifest as required under the Hazardous and Other Waste Transboundary Movement Rules, 2016 as amended, for which suitable conditions to be imposed and amended under the approvals granted to the industry by KSPCB. The company has to submit a time bound action plan covering all the feasible options for resolving all the associated problems. Regional Director also added that the tube well samples are being collected and analyzed and will come out with further suggestions, if required.

The committee also heard the applicant over telephone. The applicant Mr. Padmakumar informed that the acquisition of land near the temple area is not included due to political issues. He added that the committee also not visited the area on the southern side of the temple which is highly affected. There is no aim to close down the company. But the company is not at all complying with the directions of NGT. During the flood in 2018, red coloured water entered the nearby residents and polluted drinking water. Most of the affected areas are not considered even for land acquisition. In response, The Principal Secretary mentioned that the committee had made some additional recommendations to the company and the company will submit the action plan and it will be communicated to the complainant.

The Principal Secretary concluded that the company has to come up with detailed action plan as per the recommendations made by the committee and time bound action plan to be submitted to the Nodal Officer within a week to enable to take action for preparation of draft report of the Joint Committee by KSPCB.

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Chief Environmental Engineer

The Chief Environmental Engineer informed that the matter is listed for hearing on 13.12.2022 and additional time for filing final report of the Joint Committee before the Hon'ble NGT, would be sought through KSPCB legal Counsel.

The meeting ended with Vote of Thanks to all.

CHIEF ENVIRONMENTAL ENGINEER

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REGIONAL OFFICE
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Chief Environmental Engineer

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Annexure 4

[redacted]

PATTOM P.O, THIRUVANANTHAPURAM, Pin-695 004.

PCB/RO/KMML/NGT-OA No. 502/2022 Date: 04 /02/2023

From

The Chief Environmental Engineer

To

The Managing Director,
The Kerala Metals & Minerals Ltd,
Sankaramangalam, Chavara,
Kollam- 691583.

Sub :- OA No.502/2022- Compliance of consent conditions- reg.

Ref :- 1) ICO No. PCB/HO/KLM/ICO/02/10 dated 20/09/2010 valid up to 30/06/2012.
2) ICO R No. no. PCB/HO/KLM/ICO-R/04/2021 dated 13/09/2021 valid up to 31/07/2025
3) Hon'ble NGT order in O.A No.502/2022 dated 13/12/2022

Sir,

Attention is invited to the above. It is understood that M/s. KMML is not complying with the following consent conditions issued by the Board vide ref. (1) and (2).

1. Quality of treated effluent shall be within the tolerance limits.
2. Online pH measurement facility shall be provided at the outlet and maintain the records of the same.
3. Water meter shall be fixed to record the consumption of water.
4. CAAQMS and OCEEMS shall be installed and shall be maintained.

It is requested to comply with the above consent conditions and furnish a detailed report on the same including the details of hazardous waste manifest submitted to the Board in the previous year as well.

Yours faithfully,

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM *

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Chief Environmental Engineer

CHIEF ENVIRONMENTAL ENGINEER

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Annexure 5

KERALA STATE POLLUTION CONTROL BOARD
THIRUVANANTHAPURAM
13 DEC 2022
DESPATCHED

☎: General: 0471- 2312910, 2318153, 2318154, 2318155 Chairman: 2318150 Member Secretary: 2318151
E-mail: ms.kspcb@gov.in FAX: 0471 – 2318134, 2318152 web: www.keralapcb.nic.in

KERALA STATE POLLUTION CONTROL BOARD
കേരള സംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്
Pattom P.O., Thiruvananthapuram – 695 004
പട്ടം പി.ഒ., തിരുവനന്തപുരം - 695 004

PCB/HO/KLM/ICO/08/08 (Vol . XII) Date: 08/12/2022

From

The Chairman

To

The Managing Director,
Kerala Minerals and Metals Limited,
Sankara Mangalam,
Chavara, Kollam - 691 583.

Sub: Technical concurrence for geotube technology - reg.

Ref: Letter no TP/TS/PCB dated 07/11/2022.

Sir,

It was requested vide reference for technical concurrence for geotube technology. New technologies of Hazardous Waste treatment/disposal shall be implemented only after getting approval from Central Pollution Control Board. Hence you are directed to present the details of the technology before the technical committee of Central Pollution Control Board for obtaining the approval for geotube technology.

Yours faithfully,

CHAIRMAN

O/C

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM

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Chief Environmental Engineer

Annexure 6

☎: General: 0471- 2312910, 2318153, 2318154, 2318155 Chairman: 2318150 Member Secretary: 2318151
E-mail: ms.kspcb@gov.in FAX: 0471 – 2318134, 2318152 web: www.keralapcb.nic.in

KERALA STATE POLLUTION CONTROL BOARD
കേരള സംസ്ഥാന മലിനീകരണ നിയന്ത്രണ ബോർഡ്
Pattom P.O., Thiruvananthapuram – 695 004
പട്ടം പി.ഒ., തിരുവനന്തപുരം - 695 004

PCB/HO/KLM/ICO/08/08 (Vol. XII) Date: 24/09/2022

From
The Member Secretary

To
The Member Secretary,
IPC-VII, Central Pollution Control Board
Parivesh Bhavan, East Arjun Nagar,
Delhi-110032

KERALA STATE POLLUTION CONTROL BOARD
THIRUVANANTHAPURAM
24-9-22
DESPATCH

Sub: Transfer of Iron Oxide sludge - reg.
Ref: 1) Letter no. PCB/HO/KLM/ICO/08/08 (Vol. XI) dated 23/08/2022. (Copy enclosed)
2) Letter no. TP/ENV/PCB-GL dated 19/09/2022.
3) Detailed project proposal by M/s. Miracle Sands & Chemicals dated 18/03/2021. (Copy enclosed)

Sir,

The Kerala Minerals and Metals Limited (KMML), Titanium Pigment unit, Chavara is engaged in the production of Titanium Dioxide from ilmenite. through Chloride process. The Solid Waste generated in KMML includes about 75 TPD of Iron Oxide sludge from acid regeneration plant and around 50 TPD of ETP sludge. There are three Iron oxide ponds in the industry, two abandoned old ponds and a new one (pond 3) constructed in 2008. The industry informed that pond no. 3 is almost completely filled up at present. M/s. KMML had requested that they may be permitted to transfer a fraction of the sludge from iron oxide pond no.3 to iron oxide ponds 1&2 to avoid closing down of the industry due to filling up of the iron oxide pond no.3. The Board had permitted the same as a temporary arrangement subject to stringent control measures. However this cannot be continued indefinitely as public complaints exist alleging continuous seepage of contaminants from the old abandoned ponds.

KERALA STATE POLLUTION CONTROL BOARD REGIONAL OFFICE THIRUVANANTHAPURAM

As per the decision of the meeting chaired by Chief Secretary on 22/07/2022, the industry was directed to transfer the Iron oxide sludge to CTSDF of Kerala Enviro Infrastructure Limited at Ambalamedu vide letter under

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reference (1), M/s. KMML vide letter under reference (2) has requested for shifting 10000 MT of Iron Oxide residue to M/s. Miracle Sands & Chemicals, Turicorin. In the discussion held on 19/09/2022, M/s. KMML has informed that only dry sludge is accepted at the common TSDF and hence expressed the inability to transfer the Iron Oxide sludge, which is in a slurry form to KEIL.

Whileso M/s. Miracle Sands & Chemicals, vide reference (3), has already submitted a detailed project proposal for manufacturing Iron Oxide concrete bricks, along with the consent order from TNPCB valid upto March 2025 and the sale order of Iron Oxide residue (10000 MT) issued by KMML on 09/06/2020.

During the discussion held on 19/09/2022 with the officials of KMML and Miracle Sands & Chemicals, the matter was addressed and M/s. Miracle Sands & Chemicals informed that they have obtained only Consent to Establish from the TNPCB. The operational consent will be issued only, after inspecting the production of Iron Oxide Concrete Bricks from Iron Oxide residue for which a trial run needs to be conducted. Hence they requested to issue authorization as per Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016 for interstate transport of Iron Oxide sludge for conducting trial run. It is also requested to permit further disposal of remaining sludge also for manufacturing of concrete bricks subject to obtaining of Consent to Operate from TNPCB. Since disposal of Iron Oxide sludge from KMML is a key issue of utmost importance that needs urgent redressal in light of the order of Hon'ble NGT in OA. No. 142/2013 and various public complaints, kindly advice on the matter cited at the earliest.

Yours faithfully,

Encl: As above

KERALA STATE POLLUTION CONTROL BOARD * REGIONAL OFFICE * THIRUVANANTHAPURAM

MEMBER SECRETARY

Copy to:

Tamil Nadu Pollution Control Board,
76, Mount Salai,
Guindy, Chennai - 600 032

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Chief Environmental Engineer

Item No.8:-

BEFORE THE NATIONAL GREEN TRIBUNAL
SOUTHERN ZONE, CHENNAI

(Through Video Conference)

Original Application No. 74 of 2023 (SZ)
[Earlier O.A. No.502 of 2022 (PB)]

IN THE MATTER OF

Padma Kumar
Kerala.

...Applicant(s)

With

The State of Kerala
Through its Chief Secretary
Thiruvananthapuram and Ors.

...Respondent(s)

Date of hearing: 31.05.2023.

CORAM:

HON'BLE Smt. JUSTICE PUSHPA SATHYANARAYANA, JUDICIAL MEMBER

HON'BLE Dr. SATYAGOPAL KORLAPATI, EXPERT MEMBER

For Applicant(s): None.

For Respondent(s): Mrs. Niveditha S Menon represented Mrs. V.K. Rema Smrithi for R3.

ORDER

1. The above case has been Suo Motu registered by the Principal Bench of the National Green Tribunal as O.A. No.502 of 2022 (PB) on the basis of the letter petition received from one Padma Kumar which has been transferred to this Bench and renumbered as O.A. No.74 of 2023 (SZ).

2. Let notice be issued to all the respondents through the Tribunal.

3. The learned counsel Mrs. Niveditha S Menon representing Mrs. V.K. Rema Smrithi accepts notice on behalf of Respondent No.3.

4. Post the matter on 07.08.2023.

Sd/-
Smt. Justice Pushpa Sathyanarayana, JM

Sd/-
Dr. Satyagopal Korlapati, EM

O. A. No.74/2023 (SZ)
31st May 2023. Mn.

The Kerala Minerals and Metals Ltd.
(A Govt. Of Kerala Undertaking)
(An ISO 9001, ISO 14001, OHSAS 18001 & SA 8000 Certified Company)
SANKARAMANGALAM, CHAVARA-691 583
KOLLAM, KERALA, INDIA.
Phone : +91- 476-2651215 to 2651217
Fax : +91- 0476-2680101, 2686721
E-mail : contact@kmml.com, URL : www.kmml.com
CIN-U14109KL1972SGC002399

TP/TS/ENV
24.08.2023

To
The Member Secretary
State Wetland Authority (Kerala)
Thampanoor
Thiruvananthapuram,
Kerala.

Respected Sir,

Sub: State Wetland Authority (Kerala) SWAK– request letter for submitting the action taken report on construction of Garland drain and other measures as per the MOM of Joint Committee held on 09.12.22 - reg:

AE 2
2.9.23.

Ref: 1) Letter from SWAK/AI/304/2022 dt. 18.08.2023.
2) Order of the Hon'ble NGT(PB) in OA No:502/2022 on 29.08.2022 and 13.12. 2022
3) Minutes of the meeting of joint Committee held on 19.12.2022

Vide ref (1) above, we are hereby submitting the current action taken report and remedial measures.

STATUS, ACTION AND TIMELINES

Short Term Measures

Item	Work status	Target	Remarks
Construction of garland drain around the iron oxide (IOP)/ ETP ponds	After open e-tendering work order for the construction of Garland drain around new ETP/IOP and old ETP/IOP was issued to M/s Ravi Kumar & M/s Biohomes on 08.10.2019 and 08.04.2021 respectively. The period of contract was extended due to events viz. adverse climatic condition, restriction imposed as part of pandemic COVID19 lock down, local labour issues, ETP sludge shifting process etc. The works are now progressing at site. Work is getting delayed due to incessant rain and	September 2023 (NEW ETP) Nov 2023 (OLD ETP/ IOP)	About 95 % of garland drain construction around New ETP and 70 % around Old ETP/IOP has been completed. Installation

	elevated water table.		of garland pump in the new ETP pit is in progress.
Remediation of affected land near KMML premises.	-Tender was invited for the Test patch for remediation of contaminated area inside KMML premises and its consultancy works on 09.07.2019. No parties quoted. Action for limited tender for consultancy work taken on 07.08.2019. Two parties quoted the tender. Work order was issued to M/s FEDO on 05.12.2019 for consultancy and supervision of the test patch area for contaminated land in KMML premises. M/s FEDO have submitted a detailed project report with schematic drawing and lay out of the contaminated land remediation work. Tendering for test patch done in three occasions i.e, 25.02.20 (only single offer received), 24.06.2020 & 19.08.2020 (no party quoted). Due to non receipt of offers, action for doing the activity on trial basis has been initated. Accordingly Land preparations for land remediation sample Test patch area development activities started on trial basis inside KMML. Since land remediation (In-Suite flushing) inside KMML premises involved huge investment and due to non availability of competent agency to execute the same, KMML is also exploring the possibility of remediating the test patch area by Bioremediation process. In this regard we are exploring the service of M/s State Horticulture Society and sampling analysis is going on. The development activity for suitable methodology is in progress.	Time frame set is one year (June 2024)	Land preparation for the Test Patch unit completed initial discussions on bio-remediation had happened. Detail EOI on bio-remediation need to call immediately after finializing a suitable technology in in-situ bio remediation.

Solid waste management in KMML (In-situ/Ex-situ storage) - Geo tube As a trial implementation	Considering the constraint for shifting the entire quantity of sludge to newly proposed containment system and limitation of vacant land availability, another technological option was identified by KMML through US based Titanium technology consultant. The new technology involves dewatering and storage of solid waste using GEOTUBES which was presented to KSPCB in the meeting held on 10.12.2018. In principle approval was received and directed to submit details of the proposal. Tendering action for the Geotube iron oxide containment from New elevated iron oxide pond was done, received two offers & the same got placed before Board of Directors meeting for approval. Subsequently, Geotube suppliers had intimated KMML to get environmental clearance to submit offer for the tender. KMML submitted a request letter to KSPCB on 23.02.2022 for Environmental clearance approval to go ahead with the collection and containment of Iron oxide slurry in Geotubes from the elevated new iron oxide pond as trial phase activity. Dewatered Iron oxide solids can safely be transferred to offsite after the containment. A presentation of solid waste management using Geotubes was conducted at the chamber of Chairman, KSPCB on 16.05.2022 and 14.10.2022. KMML officials visited CPCB, New Delhi on 28.11.2022 and handed over the request letter for obtaining authorization for conducting trial geotube filling and containment of iron oxide from new elevated iron oxide pond. VC meeting/ technical presentation was conducted on 03.01.2023 with CPCB officials and queries were addressed, awaiting clearance. Work can be started only with the technical concurrence of	Time set is One year after getting approval from CPCB/ KSPCB and subsequent ordering.	Trail actions to start upon receipts of required approvals.

	CPCB/KSPCB. Also awaiting Government final sanction to place order.		

Long Term Measures

Item	Work status	Target	Remarks
Acid Regeneration Plant (ARP) technology modification to generate saleable iron oxide.	Tender was invited and opened in September 2019 & only one party quoted. Tender was closed on December 2019 and after evaluation of the proposal, the file was put up to the Board for approval. 243rd Board Meeting of the company held on 21.05.2020 had accorded approval for seeking final Government sanction. The file was put up to the Government on 01.06.2020, for getting final sanction. However as per the direction given by Government of Kerala, retendering done on June 2021. Global Tender was invited from technology providers for the process modification of existing Acid Regeneration Plant on 10.06.2019. The offer submitted by M/s INDROX GLOBAL PVT LTD is evaluated, approved in the 250th Board of meeting held on 15.01.2022 and submitted for Government approval. A meeting was convened under the chairmanship of Hon'ble Minister for Industries, Law & Coir on 09.06.2022 and in the meeting, it was decided to work out the price reasonableness & submit report to Government of Kerala. Accordingly, FEDO had done the cost analysis study & the report got submitted to Government for approval to place order. File is under government sanction process.	18 months from order.	Awaiting Government approval.
Value addition of by products (Iron oxide /ETP sludge)	KMML identified M/s Renuka Equipments Pvt Ltd, Nagpur, with the help of M/s NEERI, as the competent technology provider for the management of iron oxide stored in the old pond, by converting the same in to usable product.	18-24 months from the date of Order/ statutory	Board approval obtained, awaiting Government approval for

	234th Board meeting held on 04.04.2018 had given permission in principle for receiving a detailed techno-commercial offer for setting up a pilot plant from M/s REPL We have received offer from M/s REPL and evaluated. It is noticed that the proposed technology is not a field proven one and also involves investment around Rs. 400 Crores on commercial scale set up. In order to select potential agencies to carry out value addition of iron oxide & ETP sludge on a total responsibility basis with suitable technology, we have published a global Expression of Interest and the last date to offer was 15.03.2022. Offers are received from parties and CSIR-NIIST, Thiruvananthapuram was appointed as consultant to carry the technical evaluation of the proposal and they have submitted their study report. Tender was invited, Board approval obtained for awarding order to the selected parties, awaiting Govt approval for final order placement.	clearance.	entering into the agreement.

Other Actions Initiated by KMML

Item	Work status	Target	Remarks
Iron Oxide residue Sales	KMML invited e-tender for the sales of iron oxide residue for further process/value addition at end user on19.12.2019. M/s Miracle sands and Chemicals, Tuticorin quoted for the tender and sales order was issued to the party on 09.06.2020, for shifting 10,000 MT to the end user end. Sales order of iron oxide sludge was extended for obtaining statutory approvals from TNPCB and KSPCB. M/s Miracle sands and Chemicals, Tuticorin has already submitted a detailed project proposal for manufacturing Iron oxide concrete bricks along with the consent	18-24 months from the date of statutory clearance	CPCB concurrence to transfer trial quantity is in progress.

	order from TNPCB valid up to March 2025 and the sale order of Iron Oxide residue (10,000 MT) issued by KMML on 09.06.2020. In the meeting held on 19.09.2022 in KSPCB head office Thiruvananthapuram, KMML requested KSPCB sanction to shift 10,000 MT of iron oxide to carry out trial runs as per Hazardous Waste Management and Transboundary movement Rules 2016 Chapter II, Section No:9, Sub division:2. KSPCB informed KMML that a letter has forwarded to CPCB on 24.09.2022 for seeking their advice on conducting a trial. KMML officials visited CPCB on 28.11.2022 and made follow up for obtaining authorization for trial production of Iron Oxide bricks by M/s Miracle Sands and Chemicals, Tuticorin. CPCB officials informed that authorization request from KMML will be included in the next committee meeting held in 2023.		
ETP sludge sales	E-tender was invited by KMML for shifting 10,000 MT of ETP sludge from ETP pond on 04.02.2020 and subsequently the quantity enhanced from 1000Q MT to 50000 MT on 17.02.2020 . Sales order was issued to M/s Miracle sands and Chemicals on 09.06.2020 for 10,000 MT. A new sales order was issued to M/s Miracle sands and Chemicals for 40,000 MT on 08.04.2022. Completed the shifting of 10000 MT of ETP sludge from KMML and started shifting of ETP sludge for 40000 MT as per the new sales order. Permission granted to M/s Miracle Sands & Chemicals from KSPCB for collection and transportation of ETP sludge from KMML valid up to 31.03.2024.	Ongoing	10000 MT shifting completed and shifting started for 40000 MT valid up to 31.03.2024
ETP Revamping/ Modernisation	E tendering of ETP revamping/ modernization DPR done on 10.02.2022. No offer received. Contacted parties for	Time frame set for final	After finalization of DPR, e

	budgetary quote. The parties conveyed that they can proceed further only after signing an MOU. Being a public sector unit, KMML decided to go for retendering. E tendering done for DPR preparation of ETP revamping/ modernization. Three offers received and work order was awarded to M/s SBA Enviro System, Delhi and draft report got submitted by the party and the same was presented to KMML team on 26.07.2023. Further DPR corrections/ comments already sent to the party for finalizing the DPR.	DPR submission – September 2023.	tendering will be done for ETP revamping/ modernization with necessary approvals.
Capping of existing storage ponds	Capping of settling pond 1 eastern side area is over. Purchase order issued for procuring 15,000M2 of LDPE. Further capping will start once LDPE material is received over	Time frame for tendering and capping – March 2024.	Purchase order issued and material expected to receive by September 2023
Utilization of Iron oxide by making Iron Sinter – Value addition of iron Oxide	**In-house Value addition of Iron oxide** With an intension to give value addition to the iron oxide (categorized as hazardous material) and more specifically using this iron oxide as raw material for iron industry, KMML has developed an in-house technique. R&D studies proved that it can be converted to iron sinters (Sponge Iron), which is expected to be used as feed material for Iron TMT industry. Initially we have conducted a plant trial and produced 3.0 MT of sponge iron and analysis results are positive. Hence, we have conducted trial at two TMT manufacturing facilities at Palakkad and validated that it can be used as raw material for their induction furnaces. To proceed with the validation and stabilization of the utilization and to confirm the quality till the final TMT product, these companies require more quantity of sponge iron material. In view	Time Frame for setting up of a plant in KMML is minimum 2 years.	

	of this, we have conducted a second trial and produced around 10 to 15 MT of material with better quality and the separation process of the same is underway. We are expecting further trails/commercial proceedings with this material at the TMT facilities in near future and looking for positive outcome.		

As part of Corporate Social Responsibility, the company is also extending the following supports to the general public.

- Conducting regular medical camps.
- Providing medical aid to ailing patients/ palliative care.
- Support to nearby Panchayaths for providing street lights, drains, stray dog catching etc.
- Covid Second Line Treatment Centre (CSLTC) – We have setup a CSLTC at GHSS, Sankaramangalam School. This facility was a 850 Nos bedded one with oxygen support from KMML and the same was maintained for more than a year time. Rs. 4.5 Crores expended.
- Supplied liquid medical oxygen at reduced rate for pandemic treatment.
- Providing support for the infrastructure upliftment of nearby schools.
- Tailing sand supply to nearby surroundings for low lying land filling.
- Supporting welfare activities of mining area.
- Dividend payment to Government of Kerala.
- We are continuously supplying about 7 to 8 lakhs liters per day of drinking water of potable quality to the surrounding local residences.
- Potable water is supplied through pipe line around 65 kms for local residence and also in tankers.
- KMML is paying 50% of water tax of the Jalanidhi scheme for local residences.

Awards and Accolades

KMML bagged First Prize " Kerala State Level Agricultural Award 2022-Best Public Sector Unit engaged Vegetable.

The Major highlights of the award are as follows;

1) Utilized around 10 acres of barren land for agricultural activities and made it productive.

2) Harvest Utilized to serve food for more 1500peoples daily and also to the people under palliative care/ charity purpose.

3) The agricultural products are branded under the name 'Thalika'

Submitted for kind information.

Thanking You,
Yours faithfully

MANAGING DIRECTOR

For The Kerala Minerals and Metals Limited

Copy to: (1) The Chairman
Kerala State Pollution Control Board
Pattom,
Thiruvanathapuram- 695004

(2) The Chief Environmental Engineer,
Kerala State Pollution Control Board,
Pattom P O,
Thiruvananthapuram – 695004.

(3) The Environmental Engineer,
Kerala State Pollution Control Board,
District office, Ushas Building, Big Bazar
Kollam- 691001.